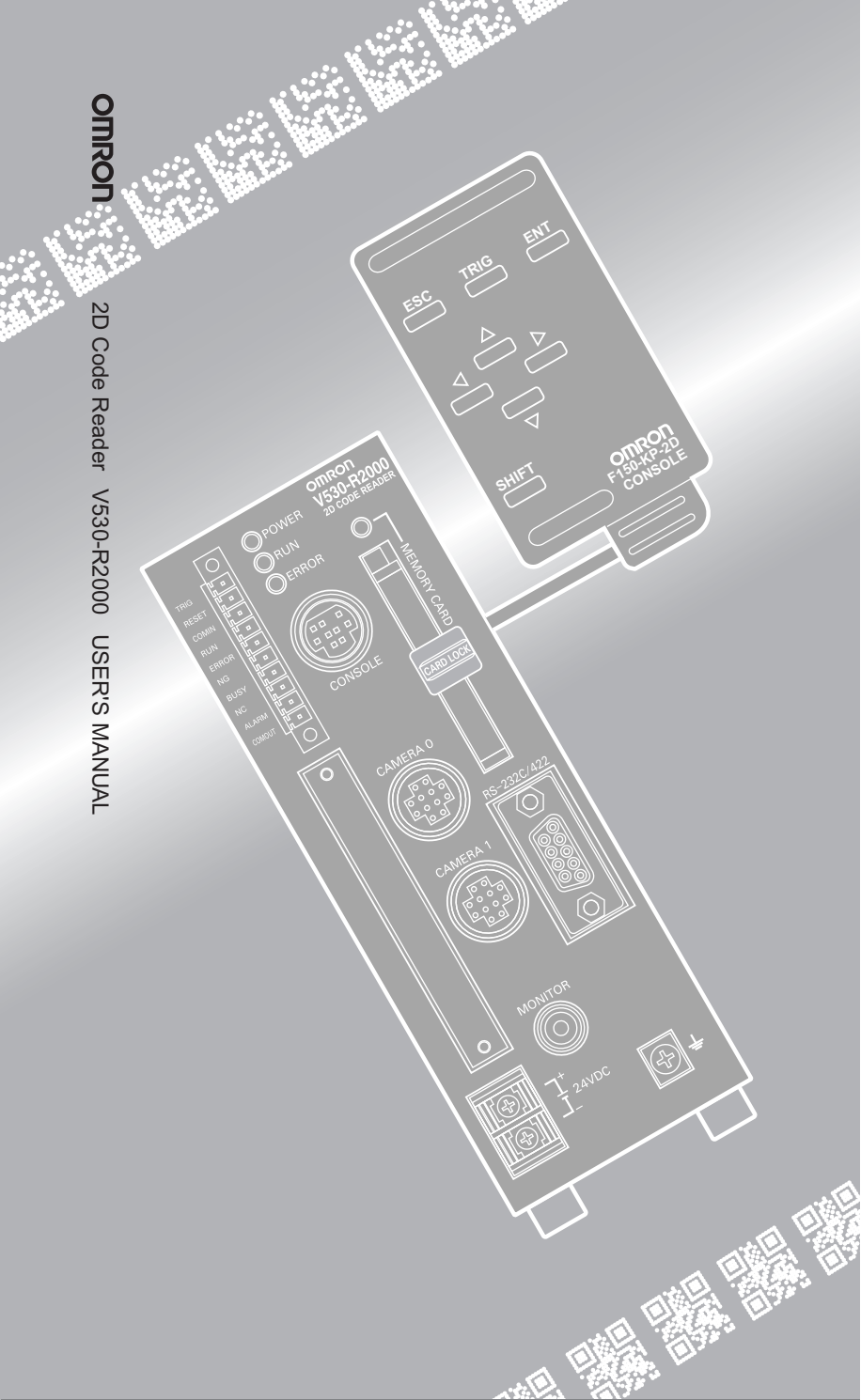




Authorized Distributor:



OMRON  
2D Code Reader V530-R2000  
USER'S MANUAL



# 2D Code Reader

V530-R2000

## USER'S MANUAL



Thank you for purchasing the V530-R2000, which is also referred to as the Controller in this manual. This manual explains how to use the Controller. Before attempting to use the Controller, be sure to read this manual in its entirety, that you understand the information provided, and that you use the Controller correctly. Keep this manual in a safe place so that it is readily available for reference whenever needed.



PREFIX	Application Considerations	PREFIX
SECTION 1	Outline	SECTION 1
SECTION 2	Installation and Connections	SECTION 2
SECTION 3	Basic Operations	SECTION 3
SECTION 4	Setting Read Conditions	SECTION 4
SECTION 5	System Settings	SECTION 5
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SECTION 7	Host Communications	SECTION 7
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SECTION 9	Appendix	SECTION 9

# 2D Code Reader (Fixed)

## USER'S MANUAL

V530-R2000



# APPLICATION CONSIDERATIONS

---

## **READ AND UNDERSTAND THIS DOCUMENT**

Please read and understand this document before using the products. Please consult your OMRON representative if you have any questions or comments.

## **WARRANTY**

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

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OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.



## **SUITABILITY FOR USE**

THE PRODUCTS CONTAINED IN THIS DOCUMENT ARE NOT SAFETY RATED. THEY ARE NOT DESIGNED OR RATED FOR ENSURING SAFETY OF PERSONS, AND SHOULD NOT BE RELIED UPON AS A SAFETY COMPONENT OR PROTECTIVE DEVICE FOR SUCH PURPOSES. Please refer to separate catalogs for OMRON's safety rated products.

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the product.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.



**PERFORMANCE DATA**

Performance data given in this document is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

**CHANGE IN SPECIFICATIONS**

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the product may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

**DIMENSIONS AND WEIGHTS**

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

**ERRORS AND OMISSIONS**

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

**PROGRAMMABLE PRODUCTS**

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

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PRECAUTIONS ON SAFETY

• Meanings of Signal Words

The following signal words are used in this manual.



Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

• Meanings of Alert Symbols

The following alert symbols are used in this document.



Indicates the possibility of explosion under specific conditions.




Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.




• Alert statements in this Manual

The following alert statements apply to the products in this manual. Each alert statement also appears at the locations needed in this manual to attract your attention.

 **WARNING**


A lithium battery is built into the V530-R2000 and may occasionally combust, explode, or burn if not treated properly.

Dispose of the Controller as industrial waste, and never disassemble, apply pressure that would deform, heat to 100°C or higher, or incinerate the V530-R2000.



A lithium battery is built into the V530-R2000 and may occasionally combust, explode, or burn if not treated properly.

When replacing the battery, never short-circuit, attempt to charge, disassemble, apply pressure that would deform, or incinerate the battery.



# Regulations and Standards

The V530-R2000 complies with the international regulations and standards listed below.

EC Directives	EMC Directive: No.89/336/EEC
EN Standards (European Standards)	EN61326: 1997, +A1: 1998 +A2: 2001 (EMI: Class A)

**Note:** The length of Signal Cables should be less than 30 m.  
The length of DC Power Supply Cables should be less than 10 m.

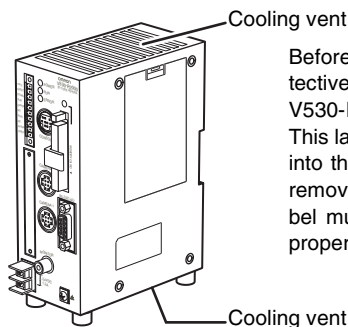


## Precautions for Safe Use

Observe the following precautions to ensure safe use of the product.

### ■ Installation Environment Precautions

- Do not use the V530-R2000 in environments with flammable or explosive gases.
- Do not block the V530-R2000's cooling vents.



Before the V530-R2000 is shipped, a protective label is attached to the top of the V530-R2000 to cover the cooling vent.

This label prevents wire strands from falling into the V530-R2000 during wiring. Do not remove it until wiring is completed. The label must be removed after wiring to allow proper cooling during operation.

- Install the V530-R2000 away from high-voltage devices and moving machinery to allow safe access during operation and maintenance.
- Be sure to securely tighten the screws when mounting the V530-R2000.

### ■ Power Supply and Wiring Precautions

- Use the V530-R2000 with the power supply voltages specified in this manual.
- Use the wire and crimp terminals of the proper sizes as specified in this manual. Do not connect the power supply wires by just twisting stranded wires and connecting them directly to the terminals.
- Keep the power supply cable as short as possible (10 m maximum).
- Use a DC power supply with countermeasures against high-voltage spikes (safe extra low-voltage circuits on the secondary side).

 p.15

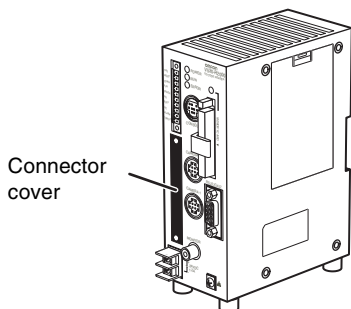
- Use an appropriate ground (100  $\Omega$  maximum).
- Use a grounding point as close as possible to the V530-R2000 and keep the ground line as short as possible.
- Wire the V530-R2000 to the ground with a separate ground wire. To avoid grounding problems, do not share the ground wiring with any other devices or ground the V530-R2000 to the building's steel framing or plumbing.

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## ■ Connectors

Do not remove the connector cover. Doing so may cause product failure.



## ■ Other Precautions

- Do not attempt to disassemble, repair, or modify the V530-R2000. Doing so may cause product failure or a fire.
- If you suspect an error or malfunction, stop using the V530-R2000 immediately, turn OFF the power supply, and consult your OMRON representative.



## Precautions for Correct Use

Observe the following precautions to prevent operation from failing, malfunctions, or adverse effects on performance or devices.

### Controller Installation Site

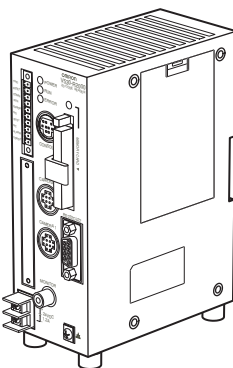
■ **Do NOT install the V530-R2000 in locations subject to the following conditions:**

- Ambient temperatures outside of 0 to 50°C (32 to 122°F)
- Rapid temperature fluctuations (likely to cause condensation)
- Relative humidity outside of 35% to 85%
- Presence of corrosive or flammable gases
- Presence of dust, salt, or iron particles
- Direct vibration or shock
- Direct sunlight
- Water, oil, chemical fumes, or chemical spray

■ **Mounting Orientation**

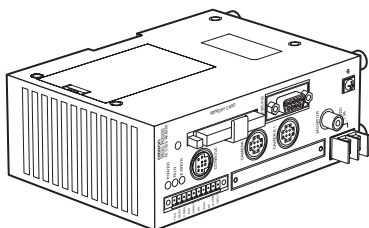
To improve heat dissipation, install the Controller in the following orientation only:

**Correct**

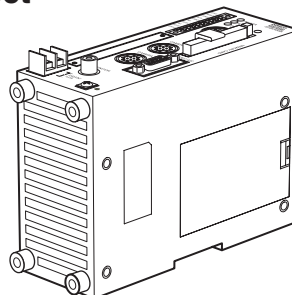


Do not install the Controller in the orientations shown in the following diagrams.

**Incorrect**



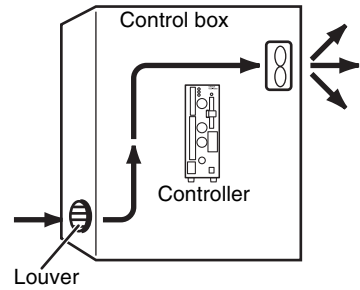
**Incorrect**





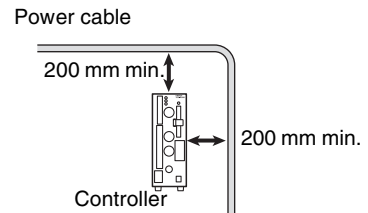
## ■ Ambient Temperature

- Maintain a minimum clearance of 50 mm above and below the V530-R2000 to improve air circulation.
- Do not install the V530-R2000 immediately above significant heat sources, such as heaters, transformers, or large-capacity resistors.
- Do not let the ambient operating temperature exceed 50°C (122°F).
- Provide a forced-air fan or air conditioning if the ambient temperature is near 50°C (122°F) so that the ambient temperature never exceeds 50°C (122°F).



## ■ Noise Resistance

- Do not install the V530-R2000 in a cabinet containing high-voltage equipment.
- Do not install the V530-R2000 within 200 mm of power cables.





## Component Installation and Handling

### ■ OMRON Components

Be sure to use the Camera, Camera Cable, and Console designed for the V530-R2000.

 p.6

### ■ Cameras and Cables

Always turn OFF the power supply before connecting or disconnecting Cameras or Cables.

### ■ Cameras

The Camera's case is connected to the 0 V line in the internal circuits. Observe the following precautions to prevent noise interference.

- Do not ground the Camera.
- Do not remove the base attached to the Camera.
- Do not remove the core attached to the F150-VS-2D Camera Cable.

### ■ Video Monitor

When using the recommended F150-M09-2D Monitor, observe the following precautions to prevent noise interference. The Video Monitor case is connected to the 0 V line in the internal circuits.

- Do not ground the Video Monitor.
- Do not ground the metallic part of the connector.
- Secure the Video Monitor with plastic screws if it is being mounted to a metallic surface.

### ■ Touching Signal Lines

To prevent damage from static electricity, use a wrist strap or another device for preventing electrostatic discharges when touching terminals or signal lines in connectors.

### ■ Memory Cards

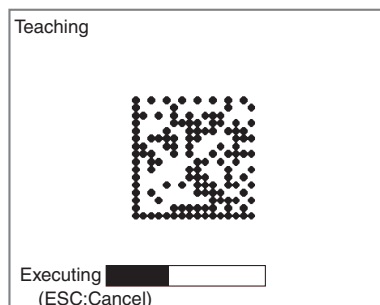
Do NOT remove the Memory Card when the Memory Card indicator is lit. The Memory Card or the Controller may be damaged.

 p.53



## ■ Turning OFF the Power Supply

Do not turn OFF the power supply while a message is being displayed indicating that processing is being performed. Data in memory will be destroyed, and the V530-R2000 may not operate correctly the next time it is started.



## ■ Using the RESET Signal

Do not use the RESET input immediately after power is turned ON. When using the RESET input to synchronize execution timing, wait at least 1 second after turning ON the V530-R2000 power supply before turning ON the RESET signal.



# Visual Aids

---



CHECK!

Indicates points that are important in using product functions or in application procedures.



Indicates where to find related information.



Indicates information helpful in operation.

## Screen Messages

In this manual, screen messages and menu commands are given in bold.

**Example:**      **System Set.** (System Settings)

**System Set./Com Mode** indicates the levels in the menu.

Trademarks: CompactFlash is a registered trademark of SanDisk.



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# SECTION 1

## Outline

This section introduces the functions and operational flow of the Controller.



Functions

2

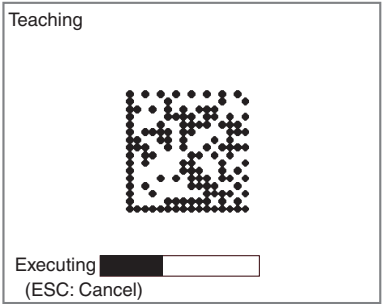


# Functions

## ■ Setting Conditions by Teaching

Read conditions can be set by using the results of reading a sample of the code prepared in advance. Read conditions are set according to the code to be read, making reading more stable and shortening reading time.

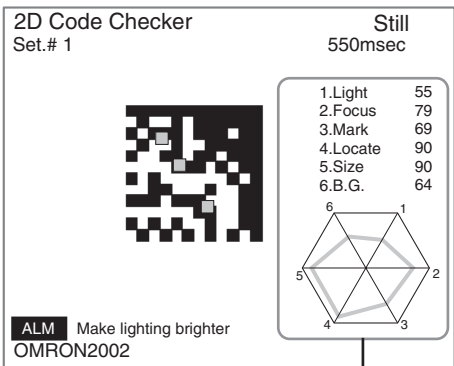
 p.28



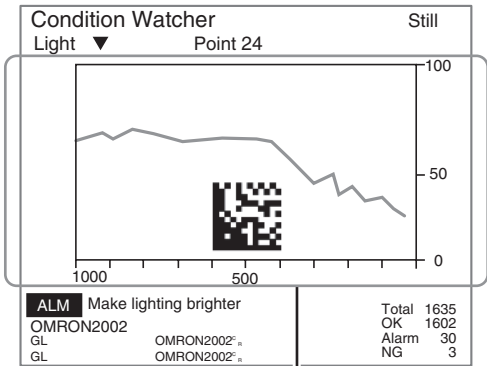
## ■ Analytical Functions

The quality of code images can be checked and ongoing reading stability can be monitored. There are two analytical functions, the 2D Code Checker and the Condition Watcher. Information based on the purpose of each function is displayed on the Read Screen. If reading quality diminishes, an alarm is displayed on the Monitor and output via an output terminal or communications.

 p.34



Appraised items



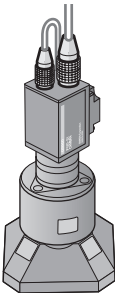
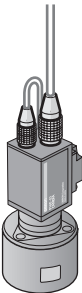
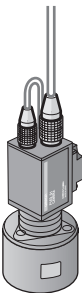
Continuous reading transition graph



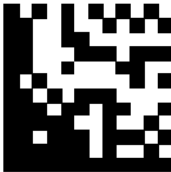

■ Reading Heads

There are three models of Reading Head, each of which integrates lighting with a zoom lens. If a Reading Head is used and teaching is performed, optimization is possible for the lighting direction for the V530-L2001 or the lighting color for the V530-L2003.

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Reading Head with Oblique/Coaxial Lighting V530-L2001	Reading Head with Ring Lighting V530-L2002	Reading Head with V-type Coaxial Lighting V530-L2003
Provides oblique/coaxial lighting arranged at various angles. Suitable for wafers, liquid crystal glass, PDP glass, electronic components, and many other types of workpiece.	Diffuse lighting arranged in a ring is used to read regular reflections from a code. This system is ideal for reading 2D codes that have been embossed in engine parts or other metal parts.	A regular reflective optical system that does not produce interference is used with diffuse light from a large opening. These, along with the ability to handle a large skew angle, makes the Reading Head ideal for reading codes from objects with mirrored surfaces, such as wafers.
		


■ Readable Codes

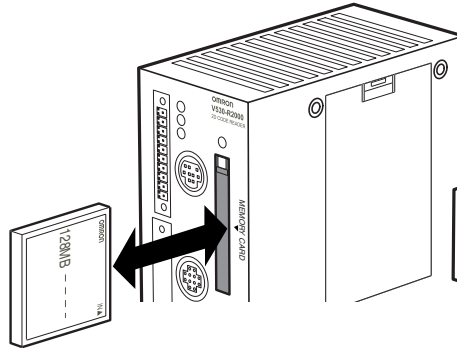
Readable Codes	DataMatrix	QR Code
		
Readable sizes (symbol size)	<ul style="list-style-type: none"><li>• ECC200</li></ul> 10 × 10 to 64 × 64 8 × 18 to 16 × 48	<ul style="list-style-type: none"><li>• Model 1 or 2</li></ul> 21 × 21 to 57 × 57 (Version 1 to Version 10)



## ■ Backing Up Data to Memory Cards

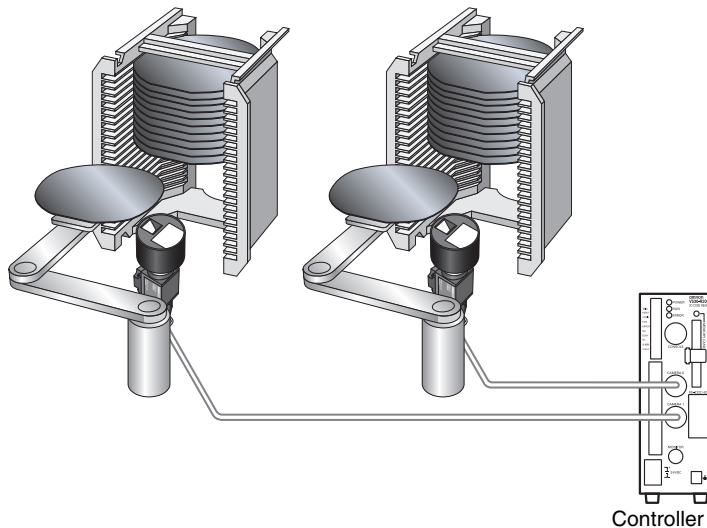
A Memory Card slot is provided to back up settings, read images, and monitoring information on Memory Cards. This data can be uploaded to the Controller except for read images.

 p.21, p.48



## ■ Connect Up To Two Cameras

Up to two Cameras can be connected to each Controller to enable reading and processing two locations.



The two Cameras cannot be used simultaneously. Select the Camera to be used.








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## SECTION 2

# Installation and Connections

This section explains how to install the Controller and connect the peripheral devices.

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 Component Names and Functions	8
 Mounting the Controller	9
 Connecting Peripheral Devices	13
 Power Supply and Ground	14



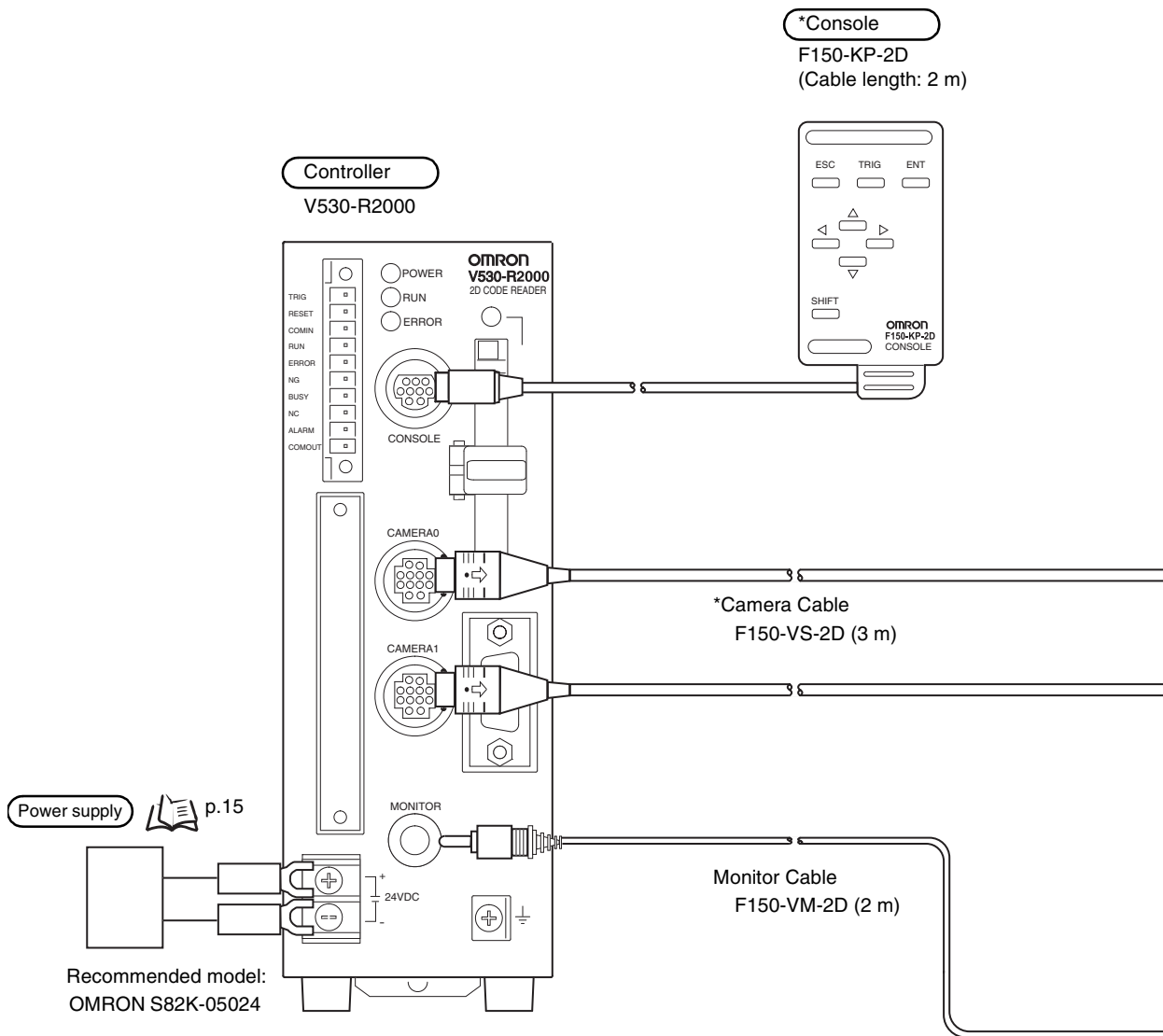
# Basic System Configuration

A basic configuration is shown below.

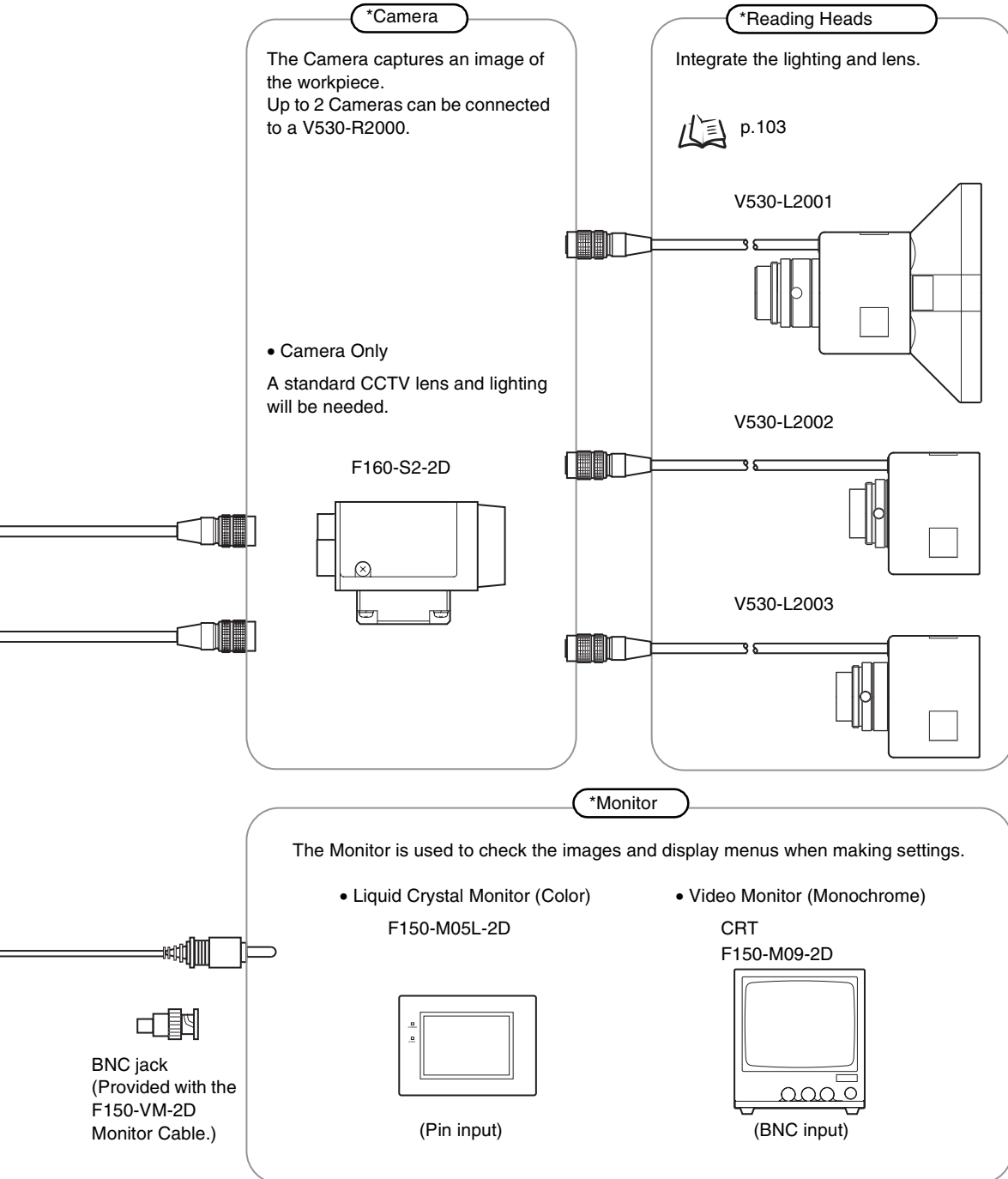


CHECK!

Components marked with an asterisk are specifically designed for the V530-R2000. Other products cannot be used. (Using other products may damage other components in the system.)

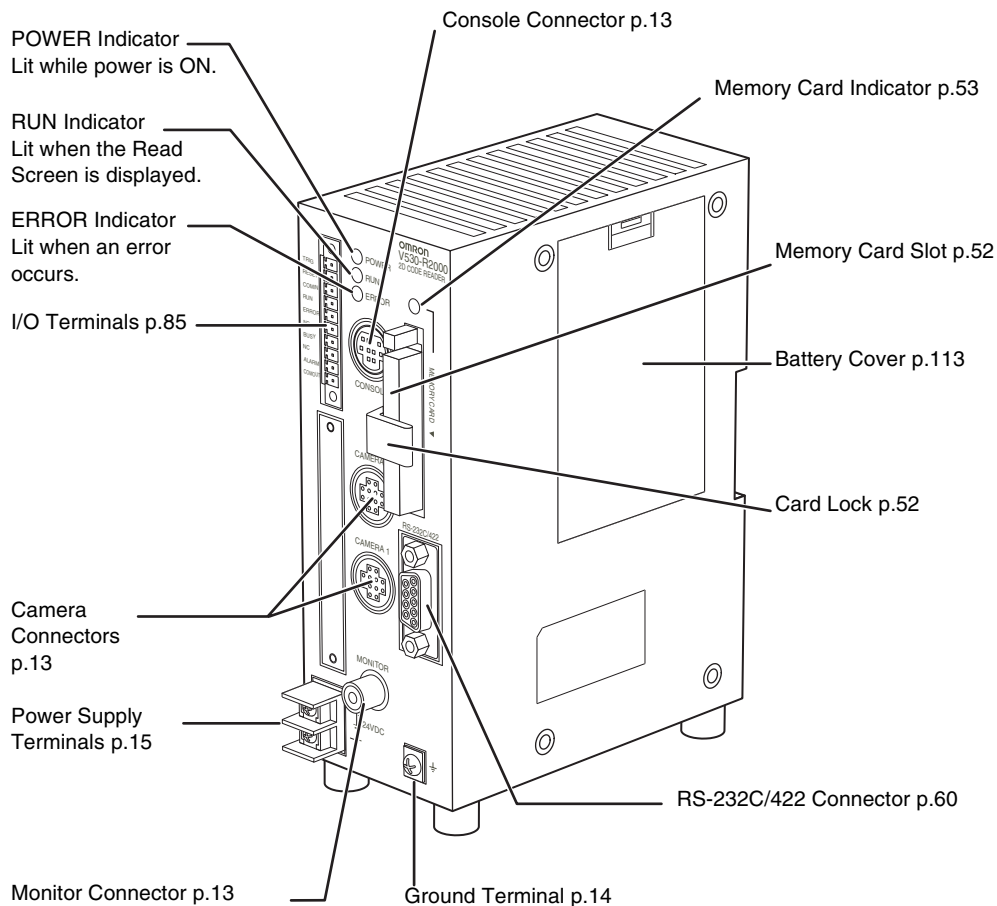








# Component Names and Functions



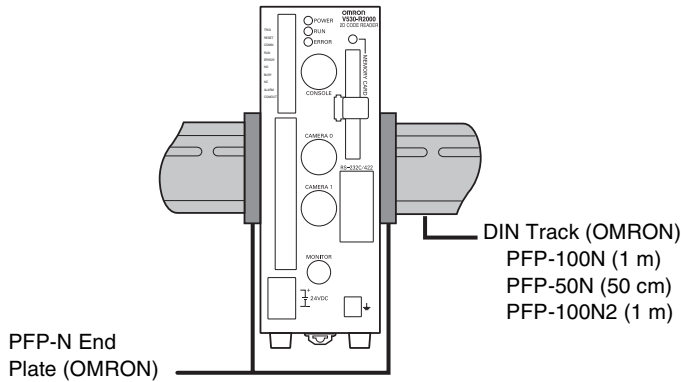


# Mounting the Controller

There are four ways to mount the Controller: DIN Track mounting, rear surface mounting, side surface mounting, and bottom surface mounting.

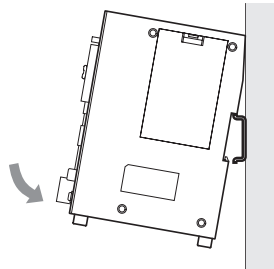
## DIN Track Mounting

The Controller can be easily mounted to or removed from 35-mm DIN Track.



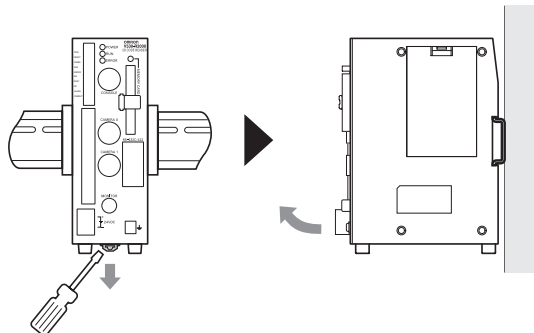
## ■ Mounting the Controller

Hook the V530-R2000 into the DIN Track as shown in the diagram and then press in at the bottom until the V530-R2000 locks into place.



## ■ Removing the Controller

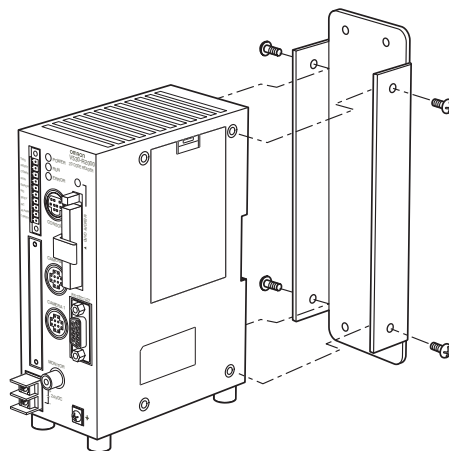
Use a screwdriver to pull the hook down and then pull out the V530-R2000 from the bottom.





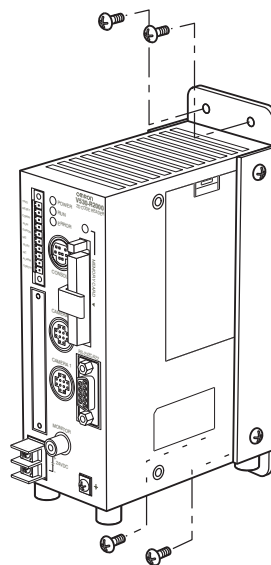
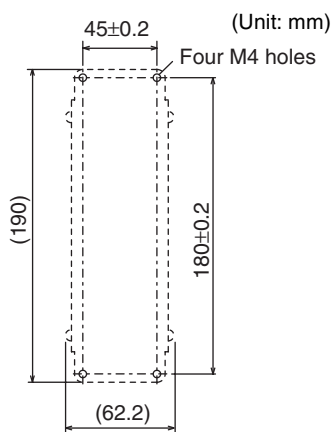
## Rear Surface Mounting

1. Attach the Mounting Bracket to the V530-R2000 Controller using the four machine screws (M3 x 6) provided with the Bracket.



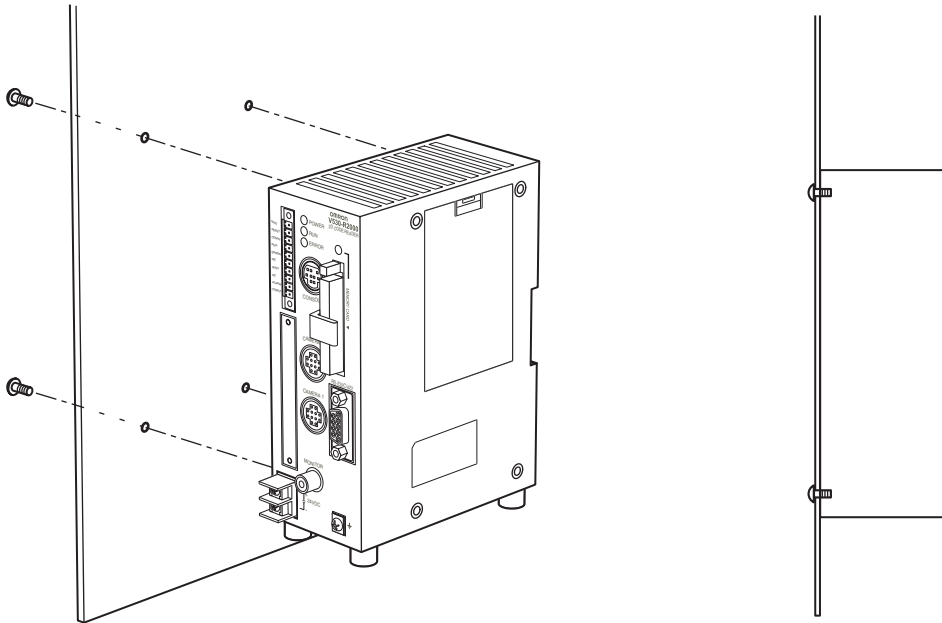
2. Secure the V530-R2000 Controller and Mounting Bracket to the mounting surface with four M4 screws.

### Dimensions

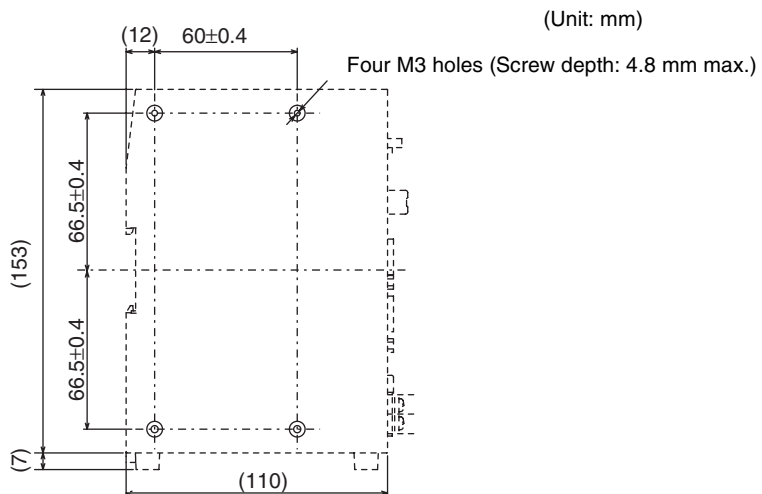




## Side Surface Mounting

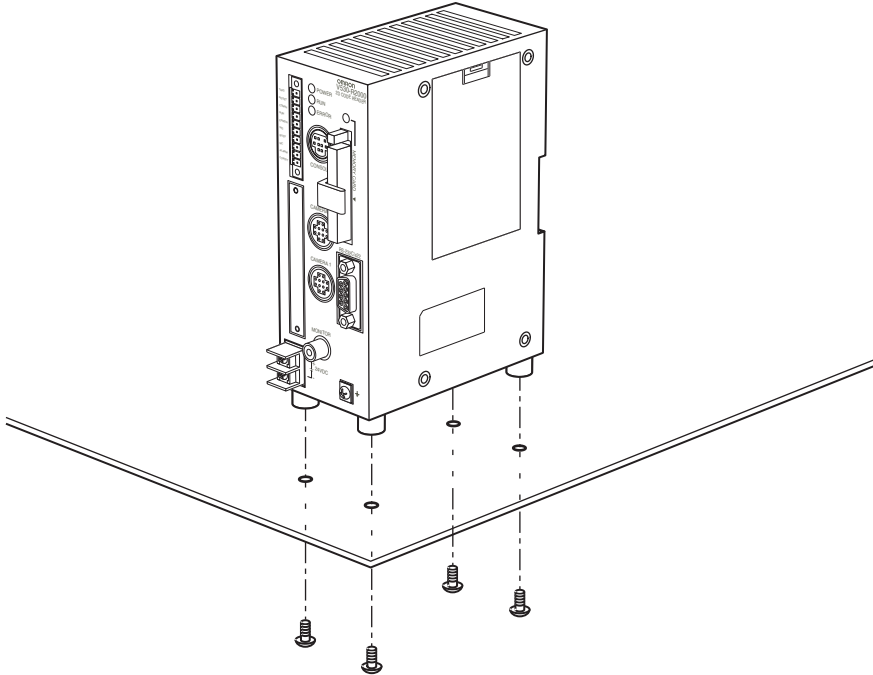


### Dimensions

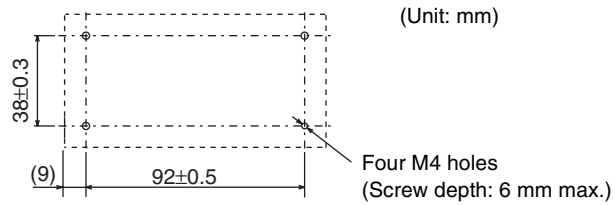




## Bottom Surface Mounting



### Dimensions





# Connecting Peripheral Devices

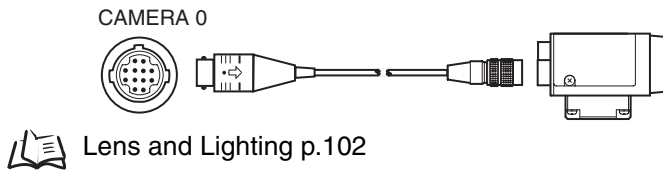
This section shows how to connect peripheral devices to the V530-R2000.



Turn OFF the power to the V530-R2000 before connecting or disconnecting Cables. Peripheral devices can be damaged if connected or disconnected with the power supply turned ON. The connectors are capped when the V530-R2000 is shipped. When not using a connector, leave the cap in place to protect against dust, dirt, and static electricity.

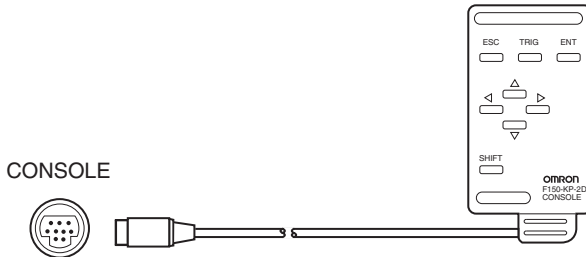
## Connecting a Camera

Connect the Camera Cable to the CAMERA connector on the V530-R2000.



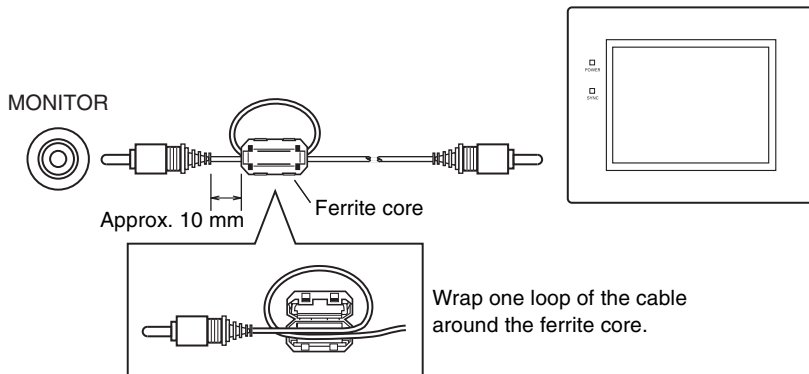
## Connecting a Console

Connect the Console to the CONSOLE connector on the V530-R2000.



## Connecting the Monitor

Connect the Monitor Cable to the MONITOR connector on the V530-R2000, and attach the enclosed ferrite core to the Monitor Cable. The ferrite core should be attached to the Cable approximately 10 mm from the MONITOR connector.



Wrap one loop of the cable around the ferrite core.





# Power Supply and Ground

Wire the power supply and the ground, and tighten the screws to a torque of 0.5 N·m. After wiring, check to make sure that the wiring is correct.

## Crimp Terminals and Cables

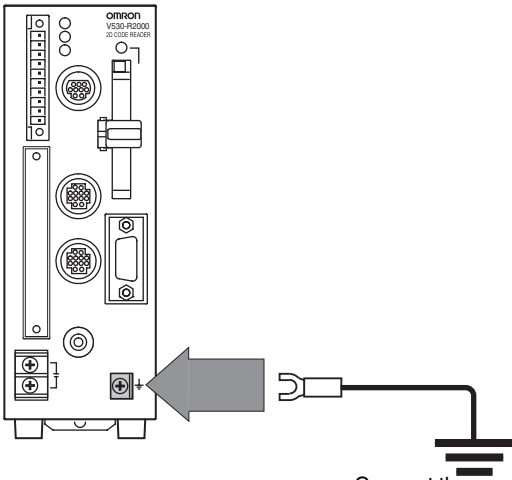
The terminal block uses M3 terminal screws. Use appropriate crimp terminals for M3 screws, as shown below.

### Recommended Models

Terminal shape	Manufacturer	Model	Recommended wire size
Forked 	J.S.T. Mfg Co., Ltd.	V1.25-N3A	1.31 to 1.65 mm <sup>2</sup> (AWG15 to AWG16)
Round 	J.S.T. Mfg Co., Ltd.	V1.25-MS3	

## Wiring the Ground

Be sure to wire the ground to a independent ground pole. To avoid damage to the equipment, do not share the ground pole with any other devices and do not wire the ground terminal to a girder. Keep the ground line as short as possible.



Connect the ground terminal to 100 Ω max.



## Wiring the Power Supply

Wire the Power Supply Unit independently of other devices. In particular, keep the power supply wired separately from inductive loads.

Use a power supply with the following specifications.

### Requirements

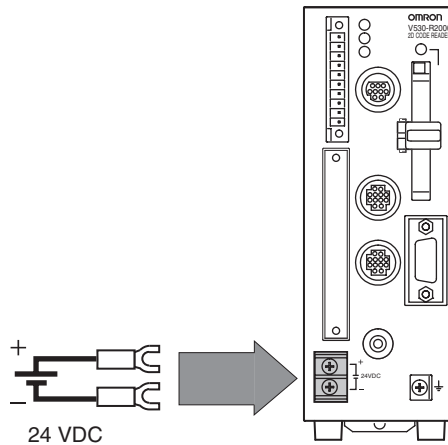
Output current	Power supply voltage
1.6 A min.	20.4 to 26.4 VDC

### Recommended Model

Model
S82-K05024



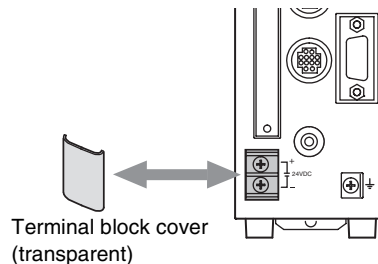
Use a DC power supply with safe extra-low-voltage circuits on the secondary side.  
If UL recognition is required for the overall system, use a UL class II power supply.



- Keep the power supply cable as short as possible (10 m max.).



Cover the power supply with the terminal block cover. Attach the terminal block cover in its original position after completing wiring. Be careful not to loose the terminal block cover when removing it.





MEMO



## SECTION 3

# Basic Operations

This section describes the basic menu operations.

☒	Flow of Operations	18
☒	Starting the Controller	19
☒	Ending Operation	22
☒	Basic Knowledge of Operations	23
	Input Keys	23
	Description of the Read Screen	24
	Navigating Menu Levels	25
	Selecting and Confirming Items	26
	Inputting Numbers	26



# Flow of Operations

Turn ON the power supply.

Starting for the first time.

Select the display language (Japanese or English).

 p.19

Copy settings from Another Controller as required.

 p.21

Basic Operations before Reading

Setting Conditions and Reading

Execute teaching.

 p.28

Change read conditions if necessary.

 p.30

Start reading.


 p.24

System Settings

Set the Camera and lighting conditions.

 p.45

Set the host communications specifications and I/O format.

 p.39, 59

Options

Use the analytical functions.

 p.34

Check the read image.

 p.54

Back up images, read conditions, and system data.

 p.48

Saving Settings

Save settings before turning OFF the power.

 p.22

Problems?



Error messages and error codes

 p.96



Troubleshooting

 p.97

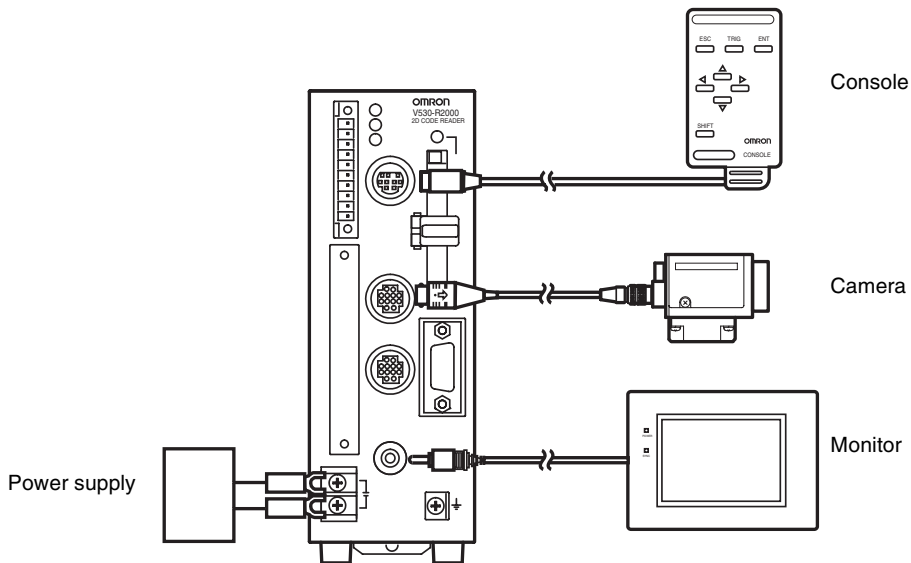


# Starting the Controller

The following procedure is used to access the menus.

1. Be sure that the basic system components have been connected correctly.

 p.6



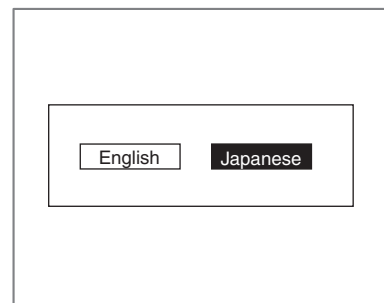
2. Turn ON the power supply to the Monitor.
3. Turn ON the power supply to the V530-R2000.

When starting the Controller for the first time, a screen to select the language will be displayed after the initial screen.



CHECK!

Do not input the RESET signal or turn OFF the power supply while the initial screen is being displayed. Data may be corrupted, preventing normal operation the next time the Controller is started.



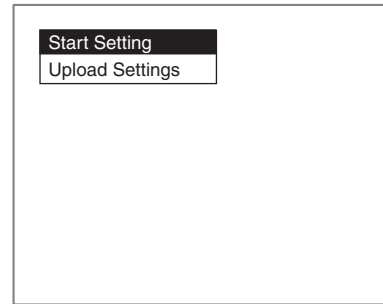
4. Move the cursor to **English** and press the **ENT** Key.



The **Start Setting** Screen will be displayed.

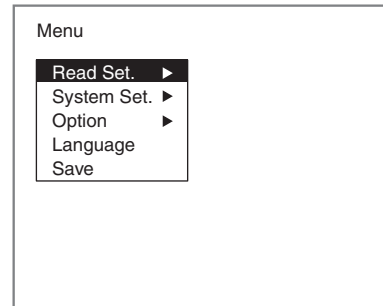
- 5.** Select **Start Setting** to set the conditions from the beginning.

Select **Upload Settings** to use settings uploaded from another Controller.



The **Menu** Screen will be displayed.

- 6.** Set the read conditions.  
Refer to *SECTION 4 Setting Read Conditions*.



After setting the read conditions and before turning OFF the power supply, save the settings in the flash memory in the Controller.

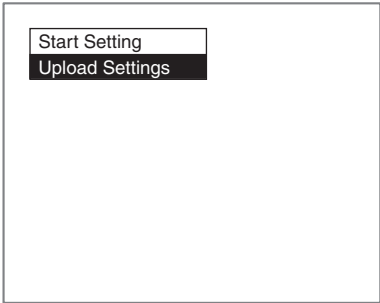


If data has been saved in flash memory, the screens in steps **4.** to **6.** will not be displayed and the Read Screen will be displayed instead.



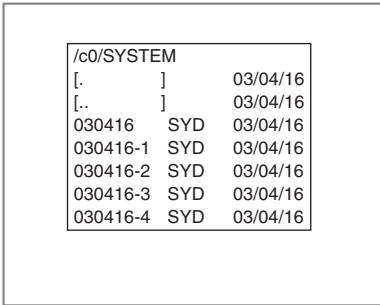
# Copying Settings from Another Controller

1. Insert the Memory Card to which the settings have been backed up.
2. Select **Upload Settings**.



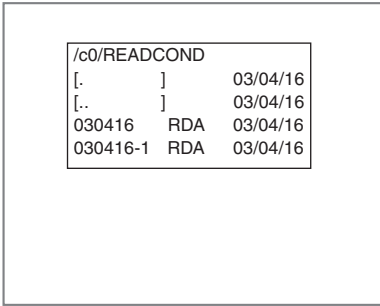
▼  
The System Data Selection Screen will be displayed.

3. Move the cursor to the data containing the settings to be uploaded and press the **ENT** Key.



▼  
The Read Conditions Selection Screen will be displayed.

4. Move the cursor to the data containing the settings to be uploaded and press the **ENT** Key.



▼  
The Read Screen will be displayed.





## Ending Operation

Before turning OFF the power supply, save the settings in the flash memory in the Controller.



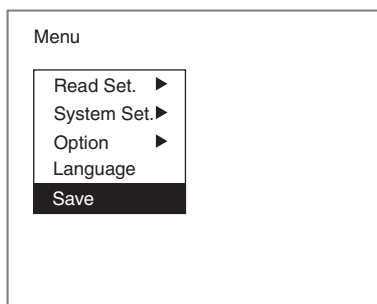
CHECK!

The Controller will load the settings contained in the flash memory every time it is started. If the power supply is turned OFF without saving any changes to the settings in flash memory, the changes will be lost. Stored images cannot be saved in flash memory and will be cleared when the power supply is turned OFF. To keep from losing stored images, back them up in a personal computer or on a Memory Card.



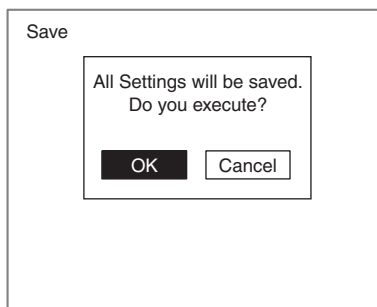
p.48

### 1. Select **Save** from the **Menu** Screen.



▼  
The **Save** Screen will be displayed along with a confirmation message.

### 2. Select **OK**.



CHECK!

Do not input the RESET signal or turn OFF the power supply while a message is being displayed indicating that data save or load processing is being performed. Data may be corrupted, preventing normal operation the next time the Controller is started.

▼  
The screen in **1.** will return when the data has been saved.

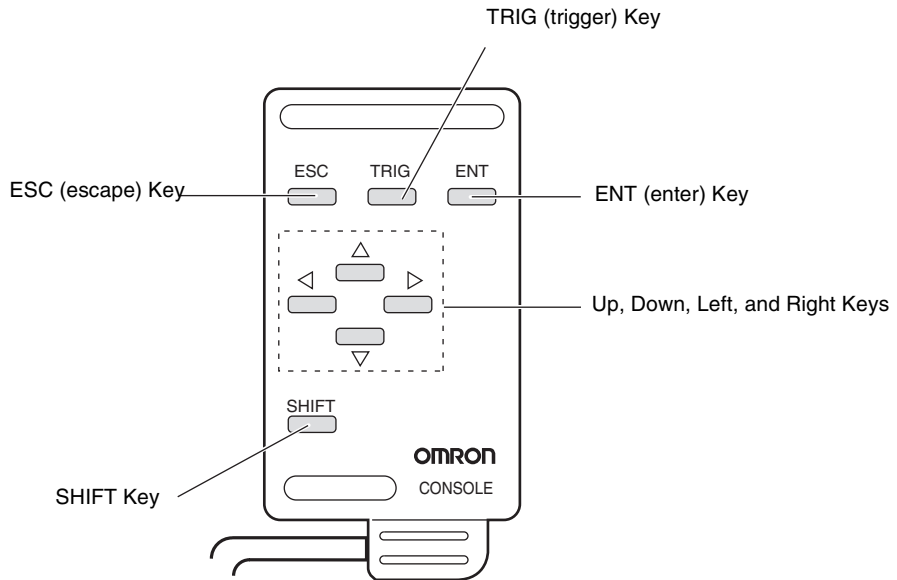
### 3. Turn OFF the power supply to end operation.



# Basic Knowledge of Operations

## Input Keys

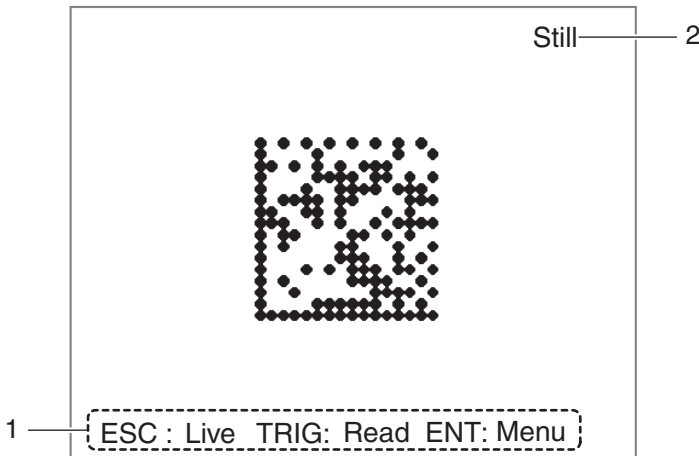
Menu operations are performed using the Console.





## Description of the Read Screen

This screen is used to receive triggers and execute reading. This is thus the main screen.



No.	Display item	Description
1	Key functions	Gives the functions of the Console Keys on the displayed screen.
2	Image display status	<p>Still: The still image that was read is displayed. Live: The current image read by the Camera is displayed in real-time.</p> <p>The Read Screen will switch between a still and live image each time the <b>ESC</b> Key is pressed.</p> <p>If reading is performed when a live image is being displayed, the start of reading the image may be delayed depending on the input timing of the command.</p> <p>Display a still image when reading moving workpieces.</p>



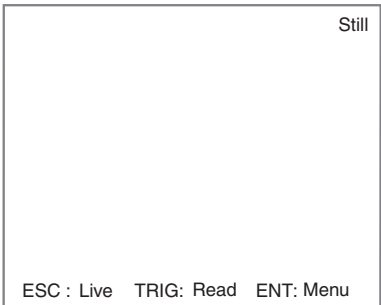
When reading is executed, the key descriptions (1) will disappear and the reading results will be displayed.



## Navigating Menu Levels

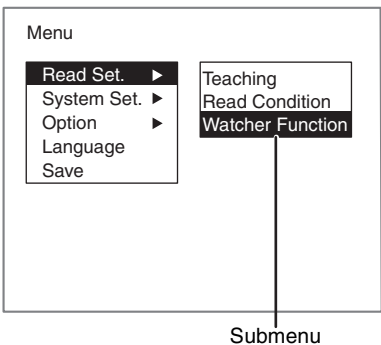
This section describes how to display menu commands and how to move between menu levels.

1. Press the **ENT** Key on the **Read** Screen.



The **Menu** Screen will be displayed.

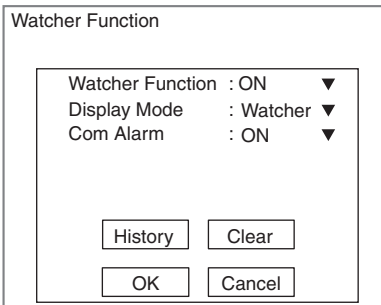
2. Move the cursor to the item to be set.  
Up/Down Keys: Move the cursor up and down.



3. Press the **ENT** Key.  
A submenu will be displayed if the cursor is moved to a menu item with a triangle and the **ENT** Key or **Right** Key is pressed.

The setting screen for the selected item will be displayed.

Screen when **Read Set./Watcher Function** Is Selected



If the **ESC** Key is pressed in the Menu Screen for **2.** the Read Screen for **1.** will return.



## Selecting and Confirming Items

Selections are available under items marked with a triangle (▼). This section describes how to make selections.

1. Move the cursor to the item to be set and press the **ENT** Key.

ON ▼

▼  
The selection will be displayed.

2. Move the cursor with the **Up/Down** Keys.  
Up/Down Keys: Move the cursor up and down.

ON ▼  
ON  
OFF

3. Press the **ENT** Key.

▼  
The selection will be committed.

OFF ▼

## Inputting Numbers

This section describes the method used to input numbers required for setting read conditions, communications, and other parameters.

1. Move the cursor to the item to be changed and press the **ENT** Key.

[ 1 0 ]

▼  
The cursor size will change to one digit.

2. Move the cursor to the digit to be changed and change the number.

Left/Right Keys: Move the cursor left and right.

Up Key: Increases the number, Down Key: Decreases the number.

3. Press the **ENT** Key.

▼  
The number will be committed.

[ 1 2 ]








## SECTION 4

# Setting Read Conditions

The read conditions for the code must be set.

This section describes teaching methods; methods for changing, switching, and deleting read conditions registered using teaching, and setting methods for analytical functions.

 Executing Teaching	28
 Changing Read Conditions	30
 Switching Read Conditions	32
 Deleting Read Conditions	33
 Using Analytical Functions	34



## Executing Teaching

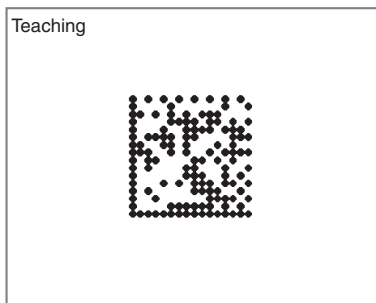
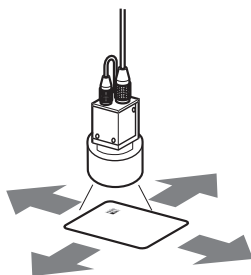
With teaching, read conditions can be set by using the results of reading a sample of the code prepared in advance. Read conditions are set according to the code to be read, making reading more stable and shortening reading time.

Up to ten sets of read conditions can be set using teaching.

### ● Read Set./Teaching

The shutter speed will be set according to the workpiece and a live image will be displayed on the screen.

1. Place the code in the center of the image and adjust the position of the workpiece until it is in focus.



2. Press the **TRIG** Key.

Teaching processing will be started.

When processing has been completed, a screen showing the results of teaching will be displayed.

3. Change any of the conditions if necessary.




Conditions that can be changed p.30

4. Select **OK**.

Screen Showing That Teaching Was Successful

Teaching Result



Code Type : DataMatrix ▼

SymbolSize : 16×16 ▼

Mirror : Normal ▼

Color : Black ▼

ShutterSpd : 1/2000

1.Light 55

2.Mark 79

3.Focus 69

4.Locate 90

5.Size 90

6.B.G. 64

ReadData : ABCEDFG

OK

Cancel

Code appraisal items



p.36



The **Teaching Register** Screen will be displayed.

5. Move the cursor to the number to which the conditions are to be registered and press the **ENT** Key.

Teaching Register

#0	*#1	#2	#3	#4
#5	#6	#7	#8	#9

Date/Time : 2003/05/20 19:00:30  
ReadData : ABCDEFG

Cancel

The conditions that were taught will be registered to the specified number.

If teaching is not successful, the presumed cause will be displayed. Check the conditions being used for teaching based on the message.

Screen Showing That Teaching Failed

Teaching Result

Teaching is incomplete.  
Can not find code.

OK



If **CANCEL** is selected or the **ESC** Key is pressed on the screen showing that teaching was successful or the **Teaching Register** Screen, the data will be deleted and the **Menu** Screen will return.



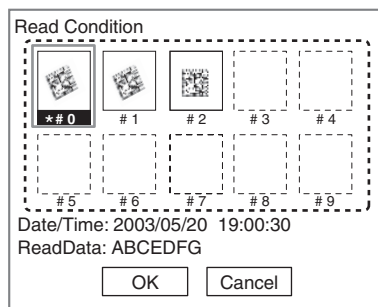
## Changing Read Conditions

Read conditions registered for teaching can be changed. Either the setting resulting from teaching or **Free** can be selected for each item. Change any of the parameters to **Free** if necessary.

### Example for DataMatrix Code

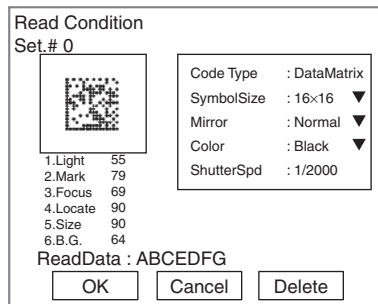
#### ● Read Set./Read Condition


1. Move the cursor to the number of the condition to be changed and press the **ENT** Key.



The **Read Condition** Setting Screen will be displayed.

2. Change the conditions as required.
3. Select **OK**.



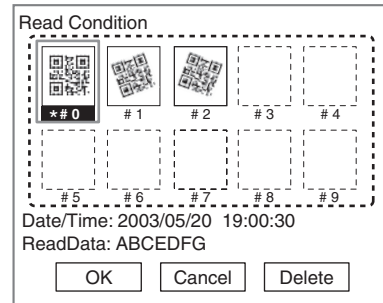
Item	Description	
Code Type	DataMatrix will be selected.	
SymbolSize	Sets the numbers of cells on the sides of the 2D code.	Select either the setting that was taught or <b>Free</b> for each item.
Mirror	Sets a normal image or a reverse image.	
Color	Sets the color of the 2D code to black or white.	
ShutterSpd	The shutter speed set by teaching is displayed.	
1.Light to 6.B.G.	The status of the code used for teaching.  p.36	
ReadData	The data contained in the code used for teaching.	



## Example for QR Code

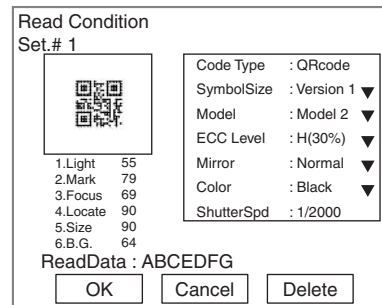
### ● Read Set./Read Condition


1. Move the cursor to the number of the condition to be changed and press the **ENT** Key.



The **Read Condition** Setting Screen will be displayed.

2. Change the conditions as required.
3. Select **OK**.



Item	Description	
Code Type	QR Code will be selected.	
SymbolSize	Sets the numbers of cells on the sides of the 2D code.	Select either the setting that was taught or <b>Free</b> for each item.
Model	Sets the model of the QR Code.	
ECC Level	Sets the error correction level of the 2D code.	
Mirror	Sets a normal image or a reverse image.	
Color	Sets the color of the 2D code to black or white.	
ShutterSpd	The shutter speed set by teaching is displayed.	
1.Light to 6.B.G.	The status of the code used for teaching.  p.36	
ReadData	The data contained in the code used for teaching.	

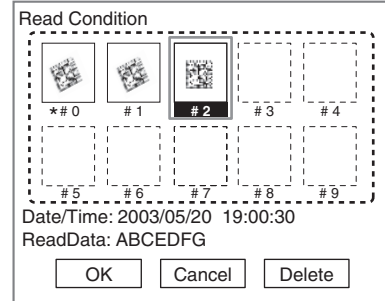


## Switching Read Conditions

The read conditions used for reading can be switched.

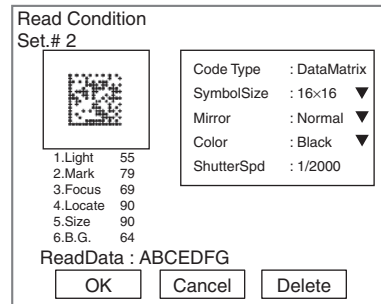
### ● Read Set./Read Condition

1. Move the cursor to the number of the conditions to switch to and press the **ENT** Key.



The **Read Condition** Setting Screen will be displayed.

2. Select **OK**.



The screen in **1.** will return.

3. Select **OK**.

The conditions used for reading will switch.

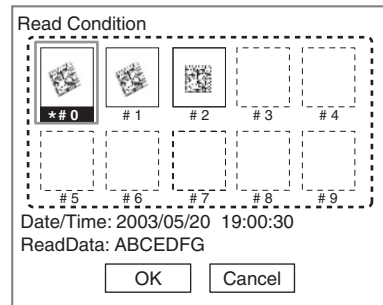


# Deleting Read Conditions

Read conditions that have been registered can be deleted.

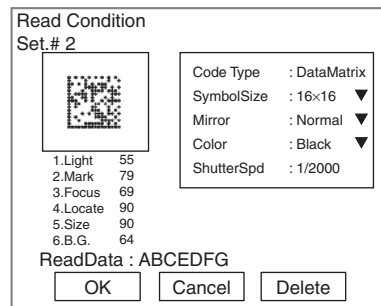
## ● Read Set./Read Condition

1. Move the cursor to the number of the conditions to be deleted and press the **ENT** Key.



The **Read Condition** Setting Screen will be displayed.

2. Select **Delete**.



The screen in 1. will return.



## Using Analytical Functions

Rather than just knowing if a code has been read or not, you'll know at a glance the leeway in reading the code. Checks are made of the imaging conditions of the code, the marking quality, and temporal changes and alarms are output. Use these functions to help prevent becoming unable to read codes.

### ● Read Set./Watcher Function

1. Make the settings for each item.
2. Select **OK**.

Watcher Function



Watcher Function : ON ▼

Display Mode : Watcher ▼

Com Alarm : ON ▼

History
Clear


OK
Cancel

Item	Selections	Description
Watcher Function	ON, OFF (default)	Select whether to display analytical functions on the Read Screen. If the Watcher Function is turned ON, the analytical screen selected for the Display Mode will be displayed.
Display Mode	Checker, Watcher (default)	Select the analytical function to display on the Read Screen. Checker: Displays the 2D Code Checker.  p.35  Watcher: Displays the Condition Watcher.  p.37
Com Alarm	ON, OFF (default)	Set whether to output an alarm to the serial interface (no-protocol) when the reading quality drops.
History	-	Can be used to check the history of the most recent 10,000 cases.
Clear	-	Deletes the Watcher data stored in the Controller.
OK	-	If the <b>Watcher Function</b> is turned <b>ON</b> , the analytical function selected for the <b>Display Mode</b> will be displayed on the Read Screen.



Alarms will be output on the ALARM terminal regardless of the setting of **Com Alarm**.

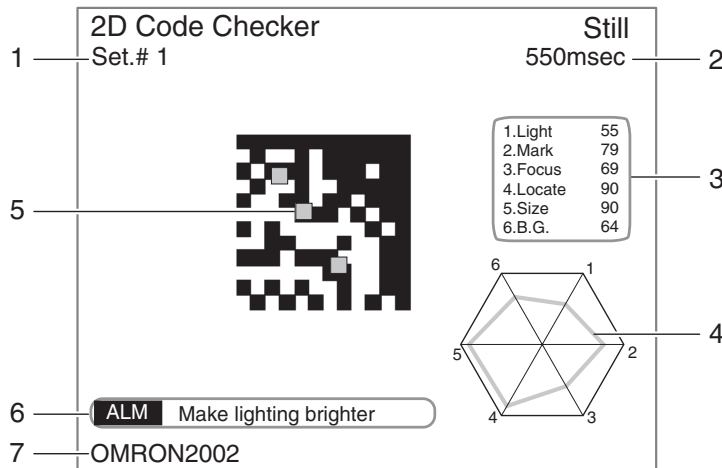




Watcher data can be saved in a Memory Card.  
 Backing Up Data in Memory Cards p.48



## 2D Code Checker

The 2D Code Checker analyzes the quality of read codes, e.g., the contrast and shape, and displays the quality as numeric values for the marking, lighting, camera position, etc. If any of the six items displayed for quality becomes unstable, and alarm is displayed and output. This enables monitoring reading stability.



No.	Display item	Description
1	Set.	Displays the condition number used when reading.
2	Reading time	Displays the time required from the input trigger to outputting reading results.
3	Appraisal Items	Displays the points for the items expressing code quality between 1 and 100. The larger the values, the more stable the quality is.  Meaning of Appraisal Items p.36
4	Radar chart	Displays the code quality data in a radar chart. Normally the radar chart is displayed in green, but it will change to red when the points for appraisal items have decreased.
5	Position of error cell	The coordinates of mistaken cells are displayed in red.
6	Quality status and comment	<b>OK</b> , <b>NG</b> , or <b>ALM</b> is displayed. If <b>ALM</b> is displayed, a comment will be displayed to indicate the cause or solution.  Comments and Countermeasures when Reading Fails p.99
7	Read data	Displays the data that was read.



When the radar chart (4) is displayed in red, use the comment (6) to perform countermeasures. Alarm levels vary with the appraisal item, code status, code size, and symbol size.



## ■ Meaning of Appraisal Items

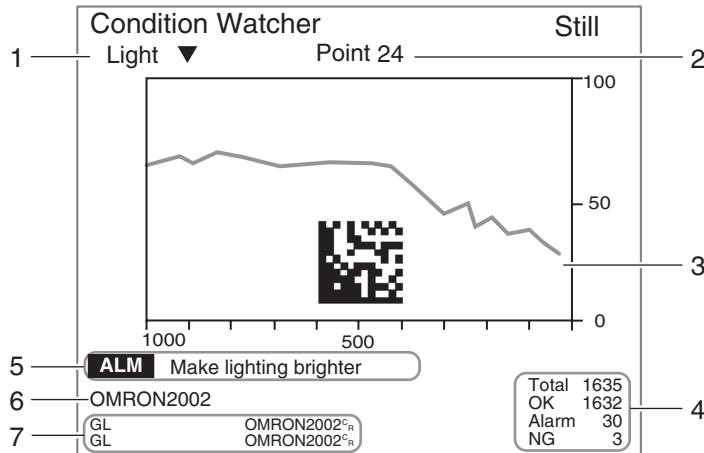
The range of values displayed for appraisal items is 1 to 100.

Item	Description
Light	Appraises the contrast between black and white of the code, which changes with lighting conditions. The display value will increase as the distinction between white and black sections of the code increases. A value of 1 will be displayed to indicate the minimum amount of contrast required to read the code.
Mark	Appraises the number of cells that cannot be discerned in the finder pattern, timing pattern, and data region. The display value will decrease as the number of cells that cannot be discerned increases and reading becomes unstable.
Focus	Appraises the focus of the image. The 2D codes cannot be discerned if they are out of focus. The display value will increase as the image goes out of focus.
Locate	Appraises the location of the code in the field of vision. The display value will be high if the 2D code is in the center of the field of vision and low if it is at the edge.
Size	Appraises the sizes of the 2D code and the cells (dots). The larger the code is in respect to the field of vision, the more accurate positioning must be. The smaller the code, however, the smaller the cells. If the cells are smaller than the resolution for imaging, then the cells cannot be discerned. The display value will decrease when the code is too large or the cells are too small. Particularly when introducing a new system, adjust the relationship between the size of the code and the field of vision to increase this value.
B.G.	Appraises the background conditions where the 2D code is marked. The display value will decrease the more the background contains patterns that resemble codes. The display value will increase if the background is plain. If the background is plain, then only the code needs to be discerned. If the background is rough or contains geometric patterns, time may be required to read codes.



## Condition Watcher

The Condition Watcher monitors transitions in continuous reading. If the monitor level falls, and alarm signal is output so that decreases in the ability to read can be detected in advance.



No.	Display item	Description
1	Appraisal item	Select the appraisal item to display on the screen. The display will change as follows then the <b>Up/Down</b> Keys are pressed: Light, Focus, Mark, Locate, None.  Meaning of Appraisal Items p.36
2	Point	Displays the quality points of the appraisal item selected at (1).
3	Graph	Displays the transitions in the total points for the most recent 1,000 readings. The most recent readings are displayed on the right. The graph scrolls left.
4	Accumulative reading information	Displays the totals of the results of reading. Total: Number of readings, OK: Number of successful readings Alarm: Number of alarms, NG: Number of failures
5	Read status and comment	<b>OK</b> , <b>NG</b> , or <b>ALM</b> is displayed. If <b>ALM</b> is displayed, a comment will be displayed to indicate the cause or solution.
6	Read data	Displays the data that was read.
7	Communications contents	Displays the contents of the last two communications with the host. The most recent command is shown on top. This information enables checking the serial interface and the communications status of the input terminals. The following is displayed as the communications contents: "Trig-in" indicates a trigger from the input terminal and "Trig-con" indicates a trigger from the Console. All other displays are commands.







MEMO



# SECTION 5

## System Settings

This section describes the communications settings required to communicate with the host, the trigger settings, and settings for the Camera being used.

 Setting the Communications Mode	40
 Setting Communications Conditions	42
 Setting the Trigger Mode	43
 Camera and Lighting Settings	45



# Setting the Communications Mode

Settings must be made according to the communications protocol. Make these settings according to the communications specifications of the host.

## Normal Communications

### ● System Set./Com Mode

1. Make the settings for each item.
2. Select **OK**.

Com Mode

Com Mode : Normal ▼

Interface : RS-232C ▼

Prefix : None ▼

Suffix : CR ▼

FCS : OFF ▼

Multidrop : ON ▼

Unit # : [ 1]

OK Cancel

Item	Selections	Description
Com Mode	Normal (default), Host Link	Select <b>Normal</b> to communicate in a no-protocol format.
Interface	RS-232C (default), RS-422	Set the data transfer method used to connect the Controller and host.
Prefix	None (default), STX, ESC	Set the code used to indicate the beginning of the command format.
Suffix	CR (default), LF, CR+LF, ETX	Set the code used to indicate the end of the command format.
FCS (frame check sequence)	OFF (default), ON	Set whether to calculate the FCS data. p.127
Multidrop	ON, OFF (default)	Set whether to use the multidrop function. If <b>Multidrop</b> is set to <b>ON</b> , the results of read processing will not be output to the serial interface until a POLLING command (requesting that data be sent) is received from the host. If <b>Multidrop</b> is set to <b>OFF</b> , the multidrop function will not be used.
Unit #	1 to 31 (default: 1)	If multidrop connections are being used, set a unit number so that the Controller can be identified. Set a different unit number for each Controller. This item is displayed only if <b>Multidrop</b> is set to <b>ON</b> .



## Host Link Communications

### ● System Set./Com Mode

1. Make the settings for each item.
2. Select **OK**.

Item	Selections	Description
Com Mode	Normal (default), Host Link	Select <b>Host Link</b> to communicate in Host Link format.
Interface	RS-232C (default), RS-422	Set the data transfer method used to connect the Controller and host.
Read Area	I/O (I/O bits) (default) HR (holding bits) LR (link bits) DM (Data Memory) None (Reading not performed. TXD instruction accepted.)	Select the area used by the Controller to check for commands.
Begin Read Word	0 to 9995 (default: 0)	Set the word to start reading from.
Write Area	I/O (I/O bits) (default) HR (holding bits) LR (link bits) DM (Data Memory) None (Writing not performed.)	Select the area used by the Controller to output execution results.
Begin Write Word	0 to 9996 (default: 100)	Set the word to start writing from.
PLC Mode Check	ON (default), OFF	If <b>PLC Mode Check</b> is set to <b>ON</b> , the PLC's mode will be checked during reading. Reading will not be performed if the PLC is not in MONITOR mode. (An error message is displayed.) If <b>PLC Mode Check</b> is set to <b>OFF</b> , a command will be sent to the PLC to force it to change to MONITOR mode when the Read Screen is entered.



# Setting Communications Conditions

The conditions for communicating between the Controller and the host can be set.  
Make these settings according to the communications specifications of the host.

## ● System Set./Com Condition

1. Make the settings for each item.
2. Select **OK**.

Com Condition

Baud Rate	: 38400bps ▼
Data Length	: 8bit ▼
Parity Bit	: None ▼
Stop Bit	: 1bit ▼

Item	Selections	Description
Baud Rate	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps (default), 57600 bps, 115200 bps	Make these settings according to the communications specifications of the host.
Data Length	7bit, 8bit (default)	
Parity Bit	None (default), Odd, Even	
Stop Bit	1 bit (default), 2 bit	



Baud rates over 20 kbps are not defined for the RS-232C standard. Depending on the cable length, communications may not be stable if **38400 bps** or higher is set. If there are problems, set the baud rate to **19200 bps** or lower.



Use the following settings when executing a Backup, Upload, or similar command (CB, CU, etc.)

Item	Setting
Data length	8 bits
Parity	None
Stop bits	1 bit



# Setting the Trigger Mode

Both the mode for the read trigger input from the TRIG input terminal and the Read Mode can be set.

● *System Set./Trigger Mode*

- 1. Make the settings for each item.
- 2. Select **OK**.

Trigger Mode

Trigger Mode : One Shot ▼

Read Timeout : [99]sec

Read Mode :Normal ▼

OK

Cancel

Item	Selections	Description
Trigger Mode	One Shot (default)	One reading is performed synchronized on the rising edge (OFF to ON transition) of the trigger signal. If reading is successful, reading is ended and the reading results is output. The trigger signal is also synchronized as the camera shutter input to enable taking images of moving workpieces in an accurate position.
	Continuous	Reading is perform continuously as long as the trigger signal is ON.
	Level	Reading is repeated until successful while the trigger signal is ON. If reading is not performed successfully, <b>NG</b> is output when the trigger signal turns OFF.
Read Timeout	1 to 99 (default: 99)	Set the timeout period. The timeout period is the period from input of the trigger until reading is forced to end.



The Trigger Mode Setting is valid only for the TRIG input terminal.  
The trigger from the Console is always a one-shot trigger.

CHECK!



Item	Selections	Description
Read Mode	Normal (default)	One reading is performed for one trigger input and the image is used as is for decoding. Normally, use this mode.
	Wide Range	Multiple readings with different shutter speeds are performed for one trigger input. Dark to light images are read, providing a wider dynamic range of lighting than for Normal Mode. This mode is effective against changes in the workpiece rate of reflection, variations in lighting, etc. Reading time, however, will increase.
	Lighting	This mode can be selected only when a V530-L2001 or V530-L2003 Reading Head is being used. Multiple readings with different directions are performed for one trigger input for the V530-L2001 and with different colors for the V530-L2003. This mode is effective against variations in the condition of the workpiece surface. Reading time, however, will increase. The mode will automatically change to Normal Mode when a Reading Head is not connected.
	Move	Select to read codes marked on moving objects. Multiple readings are taken at 20 ms intervals for one trigger input, enabling reading high-speed moving bodies that can miss the trigger timing. Reading time, however, will increase.



# Camera and Lighting Settings

Two Cameras can be connected to one Controller.

This section describes how to select the Camera to be used and set conditions for connected Cameras.

## ● System Set./Camera/Lighting

1. Make the settings for each item.
2. Select **OK**.

Camera/Lighting

Active Port	:CAMERA 0 ▼
CAMERA 0	
Use Type	:F160-S2 ▼
Shutter spd.lmt	:1/120sec ▼
CAMERA 1	
Use Type	:Disconnect ▼
Shutter spd.lmt	:1/120sec ▼

Item	Selections	Description
Active Port	CAMERA 0 (default), CAMERA 1	Select the Camera to use to read input images.
Use Type	Disconnect (Not connected.) F160-S2 (Camera Only) L2001 (V530-L2001), L2002 (V530-L2002), L2003 (V530-L2003)	Select the models of Cameras connected to CAMERA 0 and CAMERA 1.
Shutter spd.lmt	1/120 (default), 1/200, 1/500, 1/1000, 1/2000, 1/4000, 1/8000, 1/16000, 1/30000, 1/60000	Set the lowest shutter speeds for CAMERA 0 and CAMERA 1.  The optimum speed equal or higher than the speed set here will be selected when teaching.









MEMO



## SECTION 6

# Optional Functions

This section describes methods for backing up and loading data using Memory Cards and saving images that have been read.

 Backing Up Data in Memory Cards	48
 Checking Read Images	54
 Changing the Conditions for Storing Images	55
 Backing Up Watcher Data in Memory Cards	56
 Checking the Version	57
 Changing the Language between Japanese and English	58







## Backing Up Data in Memory Cards

Four types of data can be backed up in Memory Cards, as described below. We recommend that settings be backed up in case data is corrupted or the machine fails.

The files are stored under a directory that corresponds to the root directory of the Memory Card. This directory is created automatically.

To set the same data in another Controller, back up the system data and read conditions.

### Data That Can Be Backed Up

Data	Description	Directory	File name	File Size
System data	Data set on the system setting screens can be backed up in a Memory Card.	SYSTEM	<i>date</i> .SYD	1 KB
Read conditions	Data set on the read setting screens can be backed up in a Memory Card.	READCOND	<i>date</i> .RDA	90 KB
Stored image	<p>An image stored in the Controller can be backed up to a Memory Card as a bitmap. Images are numbered from 00 to 46, where 00 is the latest image. File names are the time that each file was saved. Backup images cannot be uploaded to the Controller.</p> <p> Images can also be automatically backed up to a Memory Card. CHECK!  p.55</p>	IMAGE/ <i>date</i>	<i>time</i> .BMP	243 KB
All stored images	All images stored in the Controller can be backed up to a Memory Card at one time.		<i>time</i> .BMP	---
Watcher data	<p>The history data from the Condition Watcher can be backed up in a Memory Card.</p> <p> History data can also be automatically backed up to a Memory Card. CHECK!  p.56</p>	WATCHER	<i>date</i> .CSV	351 KB maximum



File names can be changed from the date and time to alphanumeric characters. Directory names cannot be changed.



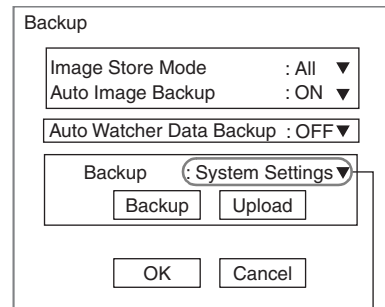
## Backing Up Data

### ● Option/Backup

1. Select the data type.

2. Select **Backup**.

Go to steps **3.** to **4.** if **Stored Image** was selected.  
Otherwise, go to step **5.**

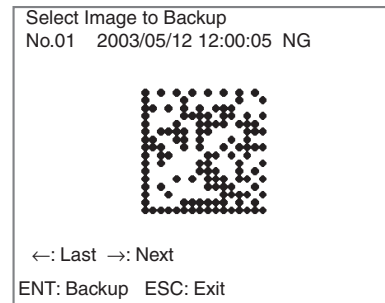


Data type

If **Stored Image** was selected, the **Select Image to Backup** Screen will be displayed.

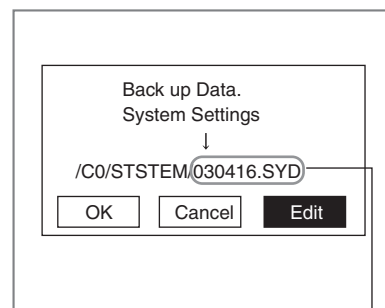
3. Display the image to be backed up.  
Left Key: Goes back one image.  
Right Key: Goes forward one image.

4. Press the **ENT** Key.



A confirmation screen will be displayed.  
The date will be displayed as the file name.

5. Select **OK** to use the date as the file name.  
Select **Edit** to change the file name.



File name



If **Edit** was selected, a software keyboard will be displayed.

6. Set a file name that is 8 characters or less.

7. Move the cursor to **END** and press the **ENT** Key.

System Settings Backup  
[LINE2] .SYD

A B C D E F G H I J K L M N  
O P Q R S T U V W X Y Z  
a b c d e f g h i j k l m n  
o p q r s t u v w x y z  
0 1 2 3 4 5 6 7 8 9 . - \_ !  
# \$ % ' ( ) ^ `

SPC DEL BS INS ← →

END

ENT:Select

Ins.

Characters that can be input  
(A period (.) cannot be input.)

SPC	Inserts a space.
DEL	Deletes one character to the right of the cursor.
BS	Deletes one character to the left of the cursor.
INS	Switches between insert (default) and overwrite modes.
←	Moves the cursor left.
→	Moves the cursor right.

A confirmation screen will be displayed.

8. Select **OK**.

Back up Data.  
System Settings  
↓  
/C0/STSTEM/LINE2.SYD

OK

Cancel

Edit



CHECK!

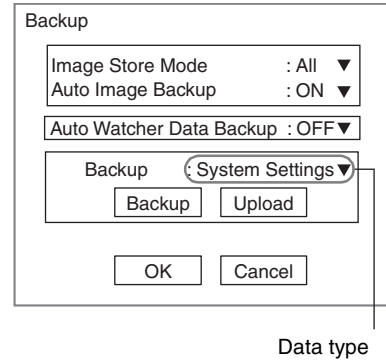
Do not input the RESET signal or turn OFF the power supply while a message is being displayed indicating that backup processing is being performed. Data may be corrupted, preventing normal operation the next time the Controller is started.



## Loading Data

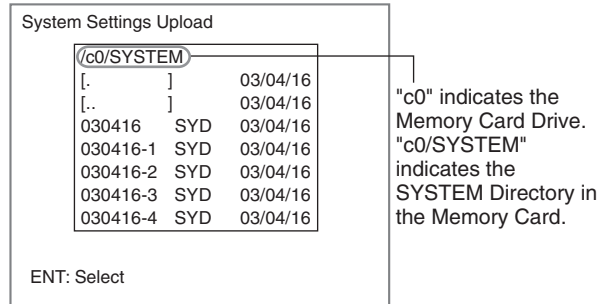
### ● Option/Backup

1. Select the data type.
2. Select **Upload**.



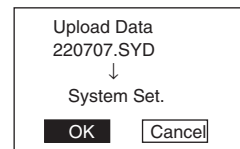
The File Selection Screen will be displayed.

3. Select the file.  
Up/Down Keys: Move the cursor.
4. Press the **ENT** Key.



A confirmation message will be displayed.

5. Select **OK**.



CHECK!

Do not input the RESET signal or turn OFF the power supply while a message is being displayed indicating that upload processing is being performed. Data may be corrupted, preventing normal operation the next time the Controller is started.



## Memory Cards

Memory Cards are used to backup settings and images. Also, Memory Cards containing data saved from the Controller can be inserted into a personal computer to easily back up the data in the computer. Do not allow the backup file sizes to exceed the capacity of the Memory Card.



Data file sizes p.48

### Recommended Models

Name	Model	Capacity
Memory Card	F160-N64S(S)	64 MB
Memory Card	QM300-N128S	128 MB
PC Card Adapter	HMC-AP001	-



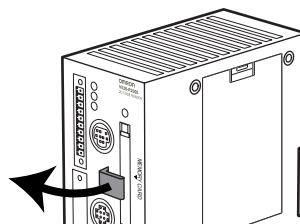
A dummy card is inserted in the Memory Card slot when the V530-R2000 is shipped. Remove the dummy card and then insert a Memory Card. When not using a Memory Card, leave the dummy card mounted to protect against dust and dirt.

### ■ Inserting a Memory Card

1. Release the card lock from the Memory Card slot.



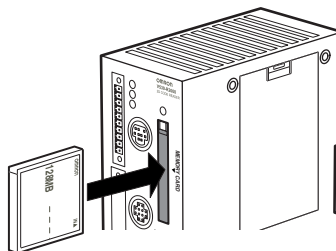
Pull gently on the card lock. Do not apply unnecessary force.



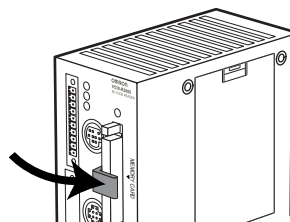
2. Insert the Memory Card.



Align **IN ▲** on the front of the Memory Card with **MEMORY CARD ▼** on the Controller and insert the Memory Card.



3. Return the card lock to its original position to secure the Memory Card.



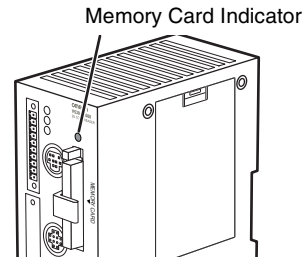


## ■ Removing a Memory Card

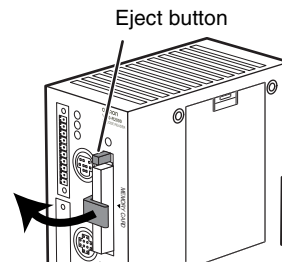
1. Confirm that the Memory Card indicator is not lit.



Do not remove the Memory Card while the indicator is lit. The Memory Card or the Controller may be damaged.

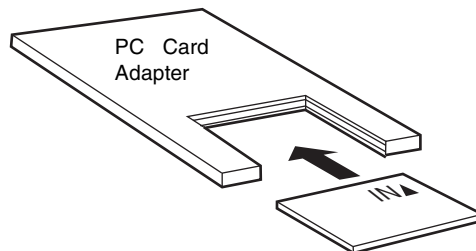


2. Release the card lock.
3. Press the eject button just above the Memory Card slot.  
The Memory Card will shoot forward slightly.
4. Pull the Memory Card straight out.



## ■ Inserting Memory Cards into Personal Computers

Insert the Memory Cards into a computer with a PC Card Drive (PCMCIA 2.0 or JEIDA 4.1 or higher conforming to Type II) or a drive compatible with Compact Flash™ cards. Before inserting a Memory Card into a PC Card Drive, insert the Memory Card into a PC Card Adapter.



Align IN ▲ on the front of the Memory Card with the front of the PC Card Adapter.



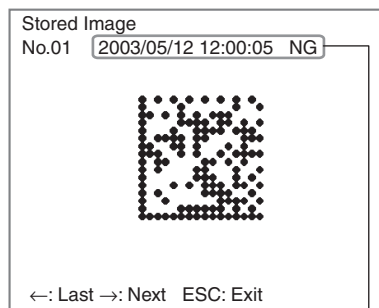
## Checking Read Images

This section describes the method for checking the read images that are temporarily stored in the Controller. This can be useful, e.g., to enable analyzing the cause when reading fails.

Up to 46 images are stored in the Controller. When more than 46 images are stored, the oldest images are overwritten. These images are deleted when the power supply to the Controller is turned OFF.

### ● *Option/Stored Image*

1. Check the image.  
Left Key: Goes back one image.  
Right Key: Goes forward one image.
2. Press the **ESC** Key to exit this screen.



Date image was read and read status



# Changing the Conditions for Storing Images

Read images are temporarily stored in the Controller. Stored images can be checked to enable analyzing the cause when reading fails.

This section describes how to select the conditions for storing images and whether to back up the images on a Memory Card at the same time.

## Names of Files Backed Up in Memory Cards

Directory	File name
IMAGE/date	time.BMP

### ● Option/Backup

1. Set the **Image Store Mode**.
2. Specify whether to automatically back up images to a Memory Card at **Auto Image Backup**.
3. Select **OK**.

Item	Selections	Description
Image Store Mode	NG	Stores images only when reading is NG.
	Alarm+NG	Stores images only when reading is NG and an alarm has been generated by an analytical function.
	All (default)	Stores an image whenever reading is performed.
Auto Image Backup	ON	Images are stored both in the Controller and in the Memory Card for the conditions specified for <b>Image Store Mode</b> .
	OFF (default)	Images are stored only in the Controller for the condition specified for <b>Image Store Mode</b> . They are not automatically saved to the Memory Card.



All of the images stored in the Controller can be saved to a Memory Card with a single procedure.  
Saving Images to Memory Cards p.48



CHECK!



# Backing Up Watcher Data in Memory Cards

History data from the Condition Watcher can be periodically backed up in a Memory Card (10,000 records maximum). The backup interval is set here.

**File Name (Fixed. The file is overwritten with each backup.)**

Directory	File name
WATCHER	wbackup.csv

● *Option/Backup*

- 1. Select the condition for **Auto Watcher Data Backup**.
- 2. Select **OK**.

Backup

Image Store Mode : All ▼

Auto Image Backup : ON ▼

Auto Watcher Data Backup : OFF ▼


Backup : System Settings ▼

Backup

Upload

OK

Cancel

Item	Selections	Description
Auto Watcher Data Backup	OFF (default)	Data is not backed up automatically. Data can be backed up manual when required.  p.48
	10	The current history data is backed up after 10 readings have been executed.
	100	The current history data is backed up after 100 readings have been executed.
	1000	The current history data is backed up after 1,000 readings have been executed.

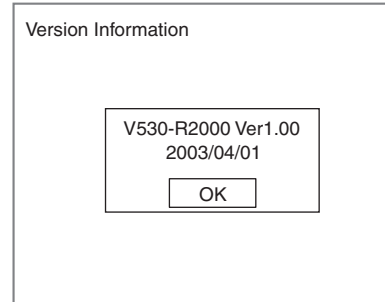


# Checking the Version

Use the following procedure to check the model of Controller and the software system version.

- *Option/Version Info.*

1. The version information will be displayed.
2. Press the **ESC** Key to exit this screen.



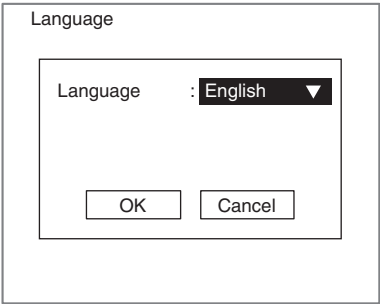


# Changing the Language between Japanese and English

Use the following procedure to select the language used to display messages on the screen.

● *Language*

- 1. Select the language for messages.
- 2. Select **OK**.





Item	Selections	Description
Language	English, Japanese	Select the language used to display messages on the screen.



# SECTION 7

## Host Communications

This section describes methods to connect a host through the serial interface or I/O Terminals and the commands that are necessary for communications.

 Serial Interface	60
Connector	60
Connection Method	60
Connection Examples	61
Normal Communications	65
Host Link	75
 I/O Terminals	85
Wiring Methods	85
Internal Specifications	87
I/O Terminals	89
Timing Charts	90



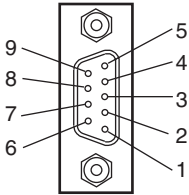
# Serial Interface

The serial interface can be used to input read triggers and output read results. Also, settings can be backed up on a personal computer. This section describes connection messages and commands. Refer to *SECTION 5* System Settings for the communications modes used to communicate with the host and the communications settings.

## Connector

The RS-232C/422 connector on the Controller is a female D-sub, 9-pin connector. The pin layout is shown below.

Pin	Signal	Function
1	FG	Protective ground
2	SD	RS-232C signal
3	RD	RS-232C signal
4	NC	Not connected.
5	RDB (RD+)	RS-422 signal
6	RDA (RD-)	RS-422 signal
7	SDB (SD+)	RS-422 signal
8	SDA (SD-)	RS-422 signal
9	SG	Signal ground

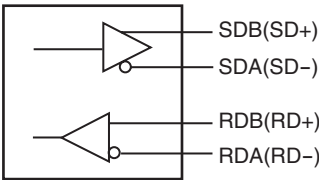


## ■ RS-422 Block Diagram

Prepare a suitable connector.

### Recommended Models

Part	Model
Plug	XM2A-0901
Hood	XM2S-0911



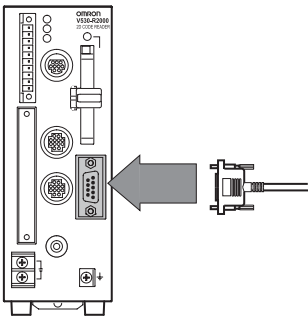
## Connection Method

Align the connector and insert it straight in. Secure the connector with the screws on both sides of the connector.



Turn OFF the power to the V530-R2000 before connecting or disconnecting Cables.

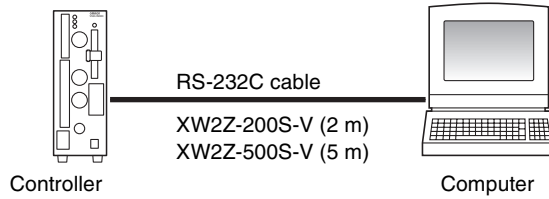
The connector is capped when the Controller is shipped. Always leave the connector capped when the communications interface is not being used to prevent dust and dirt from entering and to protect the Controller from static electricity.





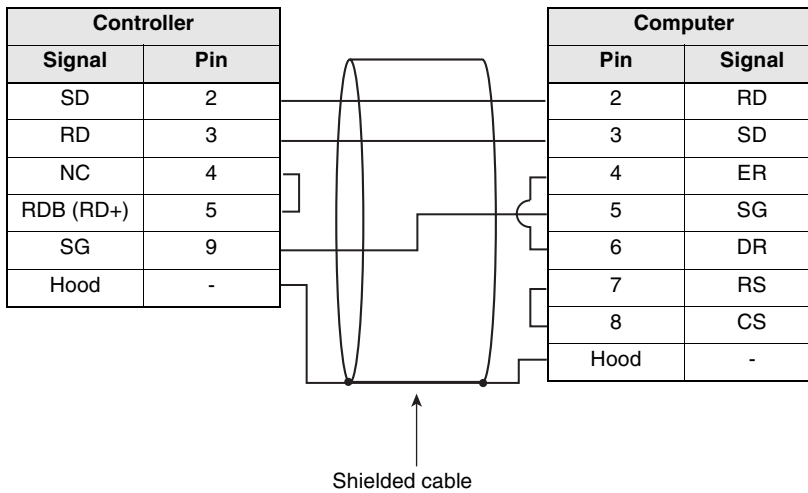
## Connection Examples

### ■ 1:1 Connection to a Personal Computer



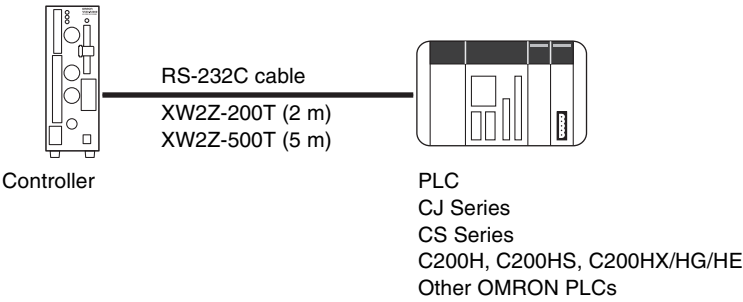
### ■ Wiring Cables (XW2Z-200S-V or XW2Z-500S-V)

Keep the cable length to less than 15 m.



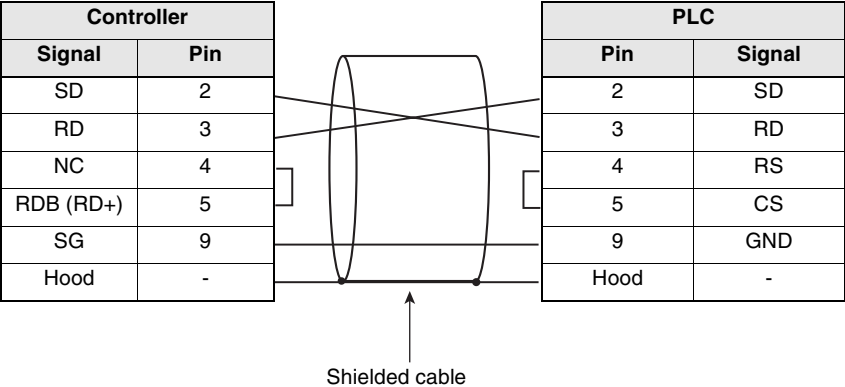


■ 1:1 Connection to a PLC



■ Wiring RS-232C Cables (XW2Z-200T or XW2Z-500T)

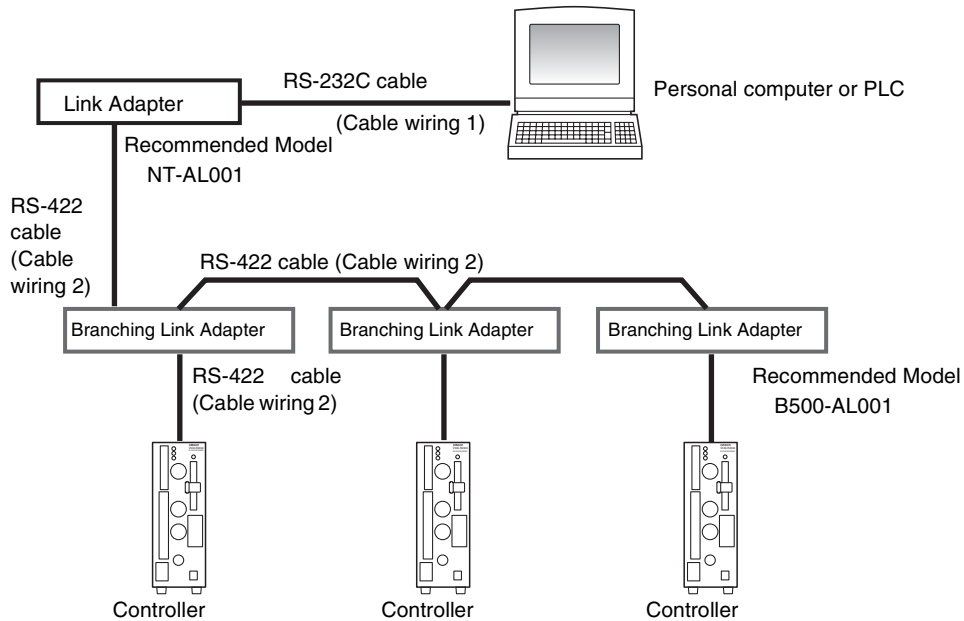
Keep the cable length to less than 15 m.





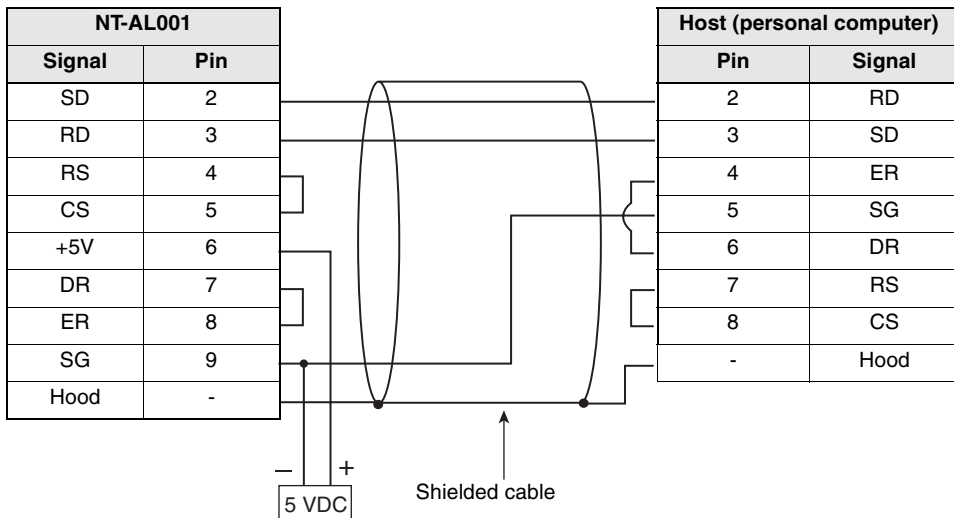
## ■ 1:N Multidrop Connections

Using a Link Adapters, one host can communicate with up to 31 Controllers.



### ■ Cable Wiring 1 (RS-232C Connection between Host and Link Adapter)

Keep the cable length to less than 15 m.



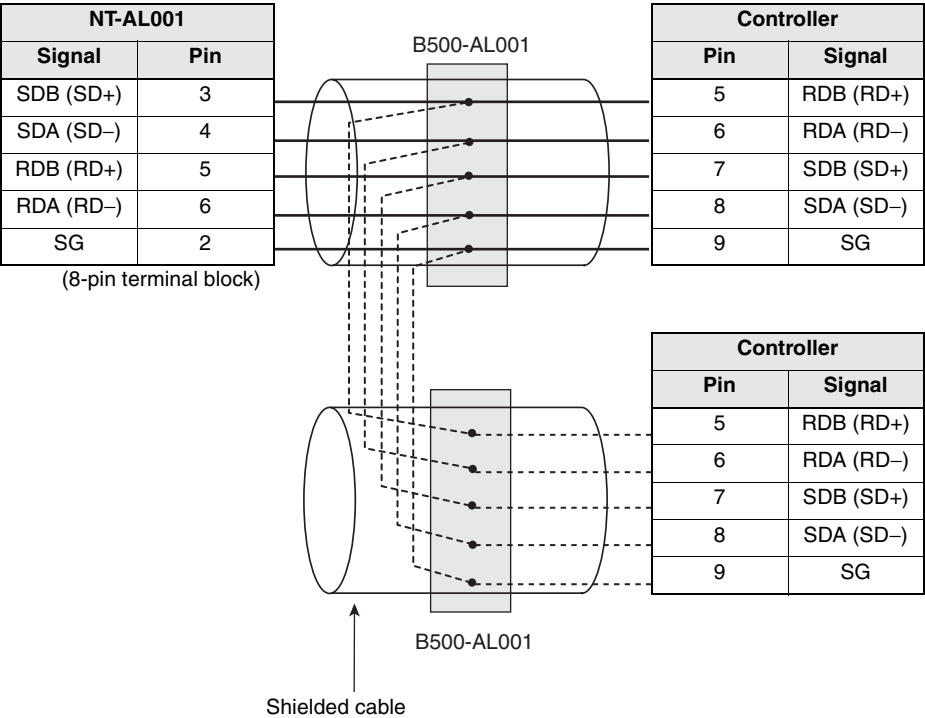
Pin numbers vary with the type and model of host that is connected. Confirm pin numbers in the documentation for your PLC or computer.



■ **Cable Wiring 2**  
**(RS-422 Connection between Controller and Link Adapter and between Branching Link Adapters)**

Use a shielded cable with 0.324 mm<sup>2</sup> (AWG22) size wires or the equivalent.

Use twisted-pair wires for SDB and SDA, and for RDB and RDA.





## Normal Communications

While the **Read** Screen is displayed, communications will be performed through the serial interface with a computer or PLC using the normal communications format.

Set the **System Set./Com Mode** to **Normal**.



p.40

### ■ Command List

#### ■ Designating Controller Operation

The following commands designate Controller operation, such as executing reading and switching read conditions.

Command	Function	Page
@GL	Performs one reading.	p.67
@SC	Stops continuous reading.	p.67
@RD	Outputs read data to the serial interface (polling).	p.68
@GT	Executes teaching.	p.68
@GM	Switches the trigger mode.	p.69
@GR	Switches the read mode.	p.69
@SN	Gets or switches read conditions.	p.70
@PC	Switches the Camera.	p.70
@DC	Switches the screen display status between a still image and a live image.	p.71
@WF	Starts/stops the Watcher function.	p.71
@WD	Switches the display on the Watcher Screen between the 2D Code Checker and the Condition Watcher.	p.71
@WR	Clears Watcher data.	p.72
@TS	Sets the date and time.	p.74

#### ■ Backing Up and Uploading Data

The following commands back up or upload settings to/from a Memory Card or the host.

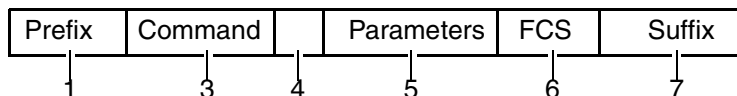
Command	Function	Page
@MB	Backs up settings in Memory Cards.	p.72
@MU	Uploads settings from Memory Cards.	p.73
@CB	Backs up settings in the host.	p.73
@CU	Uploads settings from the host.	p.74
@SV	Saves settings to flash memory.	p.74



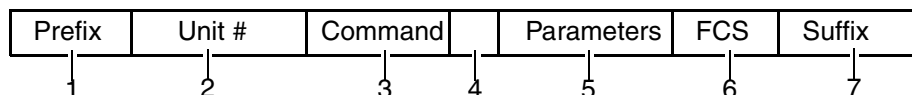
## ■ Communications Format

The commands are input in ASCII. Either uppercase or lowercase letters may be input.

### Inputs • 1:1 Connection



### • Multidrop Connections (1:N)

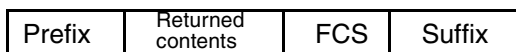


No.	Item	Number of characters	Description
1	Prefix	1	Input the code used to indicate the beginning of the command format. If the prefix is set to <b>None</b> in the communications mode, the prefix does not exist.
2	Unit #	2	When using multidrop connections, set the unit number of the Controller to which the command is to be sent (01 to 31). Set the unit number to ** to send the command to all connected Controllers.
3	Command	3	These characters indicate the operation to be executed.
4	Space	1	Insert one space between the command (3) and the parameters (5).
5	Parameters	Variable	Parameters must be specified depending on the command (3). Set the parameters, e.g., by inputting a numeric value.
6	FCS (frame check sequence)	2	Specify the FCS. If the FCS is set to <b>OFF</b> in the communications mode, the FCS does not exist.
7	Suffix	1 or 2	Input the code used to indicate the end of the command format.

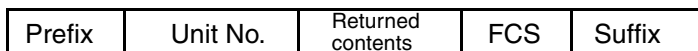


Only the command (3) through the parameters (5) are given in the format descriptions for individual commands.

### Output • 1:1 Connection



### • Multidrop Connections (1:N)



One response is returned for each command. The suffix, FCS, and prefix in the response are the same as those in the command.



• Only the returned contents when the command could not be executed normally are given in the format descriptions for individual commands.

• The following contents is returned when a command is executed normally:





## ■ Specific Command Formats

### @GL

**Function** Performs one reading.  
A reading is executed according to the set mode (one shot, continuous, or level) when the trigger is input.

#### Input

@	G	L
---	---	---

#### Output

**Communications Alarm Output for Analytical Functions Is OFF**

- Reading Successful or Alarm Generated

Read data
-----------

- When Reading Fails

?	Error code
---	------------

**Communications Alarm Output for Analytical Functions Is ON**

- Reading Successful

O	K		Read data
---	---	--	-----------

- When Reading Fails

?	Error code
---	------------

- When an Alarm Is Generated by the Condition Watcher

A	L		Read data
---	---	--	-----------

- For 1:N Connection

Read data is not output until a POLLING command is input.

### @SC

**Function** Performs continuous reading until the stop command (@SC) is sent.  
This command is valid for a level trigger or a continuous trigger.

#### Input

@	S	C
---	---	---

#### Output

O	K
---	---



## @RD

**Function** Outputs the current read data. (POLLING command)  
This command is used to resend data lost due to communications errors or to have data sent for multidrop connections.

### Input

@	R	D
---	---	---

### Output

#### Communications Alarm Output for Analytical Functions Is OFF

##### • Reading Successful or Alarm Generated

Read data
-----------

##### • When Reading Fails

?	Error code
---	------------

#### Communications Alarm Output for Analytical Functions Is ON

##### • Reading Successful

O	K	Read data
---	---	-----------

##### • When Reading Fails

?	Error code
---	------------

##### • When an Alarm Is Generated by the Condition Watcher

A	L	Read data
---	---	-----------

## @GT

**Function** Executes teaching.

### Input

@	G	T	Read condition
---	---	---	----------------

Specify 0 to 9 for the read condition number.

If the read condition number is omitted, the current read condition number will be overwritten.

### Output

#### When Teaching Was Successful:

G	T	O	K
---	---	---	---

#### When Teaching Failed:

G	T	N	G
---	---	---	---



## @GM

**Function** Switches the trigger mode.  
A trigger is not input; only the mode is changed.

### Input

@	G	M		Trigger mode
---	---	---	--	--------------

Specify the trigger mode as follows:

Trigger mode	Description
0	One-shot trigger
1	Continuous trigger
2	Level trigger

### Output

O	K
---	---



Output communications commands specifying a level trigger until reading is successful. When using a level trigger form the input terminal, however, commands will not be output when readings fail while being processed.  
A one-shot trigger will be set automatically when the multidrop setting is set to ON.

## @GR

**Function** Switches the read mode.

### Input

@	G	R		Read mode
---	---	---	--	-----------

Specify the read mode as follows:

Trigger mode	Description
0	Normal mode
1	Wide range mode
2	Lighting mode
3	Move mode

### Output

O	K
---	---



## @SN

**Function 1** Checks the read condition number.

**Input**

@	S	N
---	---	---

**Output**

O	K		Read condition No.
---	---	--	--------------------

**Function 2** Switches the read condition number.

**Input**

@	S	N		Read condition No.
---	---	---	--	--------------------

Specify 0 to 9 for the read condition number.

**Output**

O	K
---	---

## @PC

**Function** Selects the Camera to use when two Cameras are connected.

**Input**

@	P	C		Camera number
---	---	---	--	---------------

Input the camera number.

Camera number	Description
0	Use CAMERA 0.
1	Use CAMERA 1.

**Output**

O	K
---	---



## @DC

**Function** Switches the monitor screen display status between a still image and a live image.

### Input

@	D	C		Screen display status
---	---	---	--	-----------------------

Input the image display status.

Screen display status	Description
0	Switches to a still image.
1	Switches to a live image.

### Output

O	K
---	---

## @WF

**Function** Starts/stops the Watcher function.

### Input

@	W	F		Watcher status
---	---	---	--	----------------

Input the Watcher status.

Watcher status	Description
0	Starts the Watcher.
1	Stops the Watcher.

### Output

O	K
---	---

## @WD

**Function** Switches the Watcher function display mode.

### Input

@	W	D		Display mode
---	---	---	--	--------------

Input the display mode.

Display mode	Description
0	2D Code Checker
1	Condition Watcher

### Output

O	K
---	---



## @WR

**Function** Clears the history data from the Watcher function. History data that was saved will be deleted.

**Input**

@	W	R
---	---	---

**Output**

O	K
---	---

## @MB

**Function** Backs up settings in the Memory Card.

**Input**

@	M	B		Data to back up		File name
---	---	---	--	-----------------	--	-----------

Input the data to be backed up.

Data to back up	Description
00	Most recent image
01 to 46	Corresponding image number
SY	System data
RC	Read conditions
WT	Watcher data

Specify eight characters or less for the file name. The file name extension is not required.

The directory where the backup is made depends on the type of data.



Data types and directory names p.48



CHECK!

If the file name is omitted, it will automatically be added according to the data type.



Data types and file names p.48

**Output**

O	K
---	---



## @MU

**Function** Uploads settings from the Memory Card.

### Input

@	M	U		Data to upload		File name
---	---	---	--	----------------	--	-----------

Input the data to be uploaded.

Data to upload	Description
SY	System data
RC	Read conditions
WT	Watcher data

Specify eight characters or less for the file name. The file name extension is not required.

### Output

O	K
---	---

## @CB

**Function** Backs up settings in the host.

### Input

@	C	B		Data to back up
---	---	---	--	-----------------

Input the data to be backed up.

Data to back up	Description
00	Most recent image
01 to 46	Corresponding image number
SY	System data
RC	Read conditions
WT	Watcher data

### Output

R	E	A	D	Y
---	---	---	---	---

After outputting the READY signal, the Controller will automatically switch to XMODEM communications and output 

O	K
---	---

 after a normal end.



## @CU

**Function** Uploads settings from the host.

### Input

@	C	U		Data to upload
---	---	---	--	----------------

Input the data to be uploaded.

Data to upload	Description
SY	System data
RC	Read conditions
WT	Watcher data

### Output

R	E	A	D	Y
---	---	---	---	---

After outputting the READY signal, the Controller will automatically switch to XMODEM communications and output 

O	K
---	---

 after a normal end.

## @TS

**Function** Sets the time and date of the internal clock.

### Input

@	T	S		Yr	Mo	Day	Hr	Min	Sec
---	---	---	--	----	----	-----	----	-----	-----

Set four digits for the year and two digits for all other time and date elements. The seconds may be omitted.

### Output

O	K
---	---

## @SV

**Function** Saves the read conditions, system settings, and history data in flash memory inside the Controller.

### Input

@	S	V
---	---	---

### Output

O	K
---	---



## Host Link

While the Read Screen is displayed, communications will be performed through the serial interface with a PLC or other host using the Host Link communications format.

It is not necessary to program communications in the PLC.

The Controller will automatically process communications.

Set the **System Set./Com Mode** to **Host Link**.

 p.41



CHECK!

Only 1:1 connections are supported for Host Link communications. The 1:N connections are not supported.



CHECK!

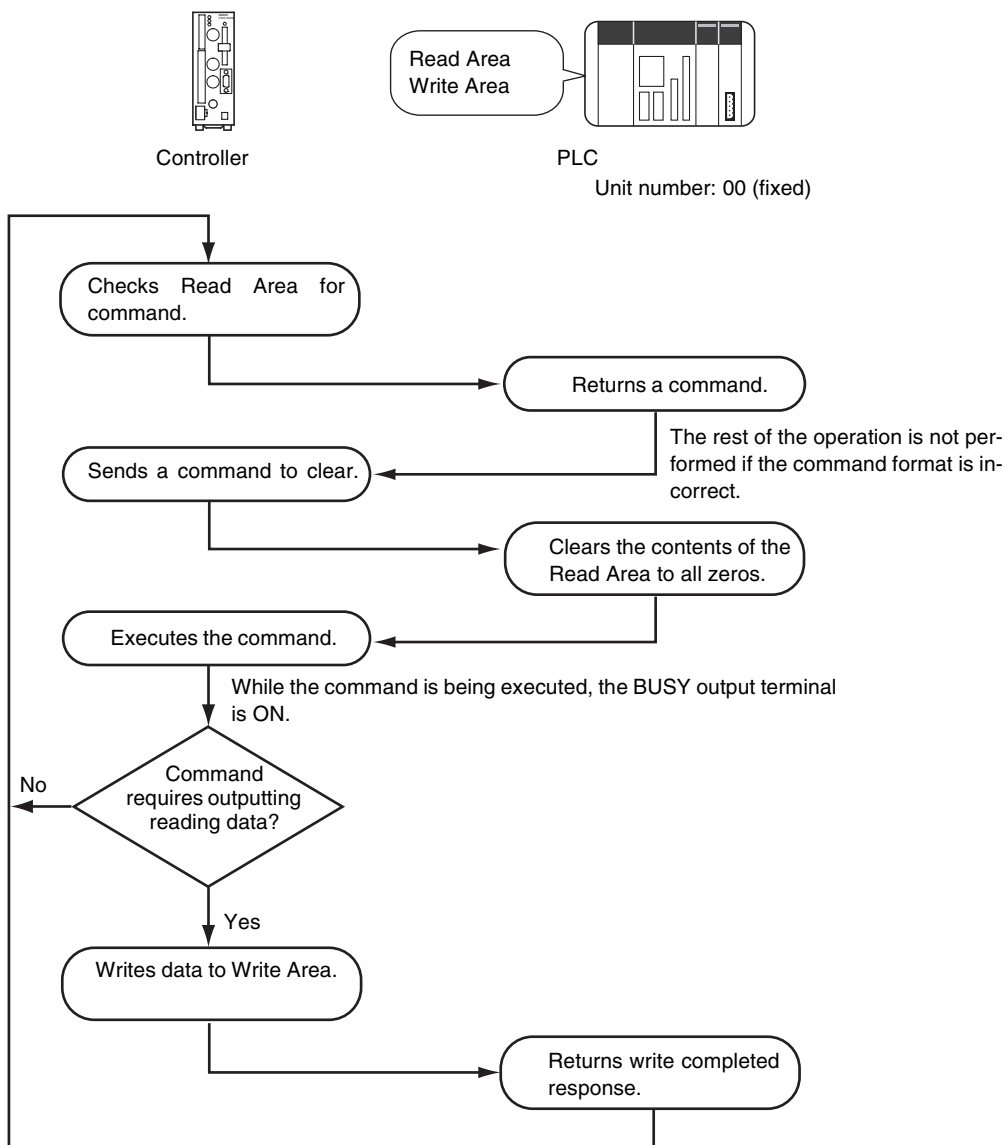
If the power supply to the PLC is OFF when Host Link communications are used, the Controller will show a Host Link Error and the ERROR output terminal will turn ON. Furthermore, the setting for the type of communications under **System Set./Com Mode** will automatically switch to **Normal**.



## ■ Flowcharts

### ■ Using the Serial Interface for Both Input and Output

Commands for the V530-R2000 are written to the Read Area in PLC memory. The V530-R2000 automatically reads these commands and executes them. Reading results are written to the PLC.



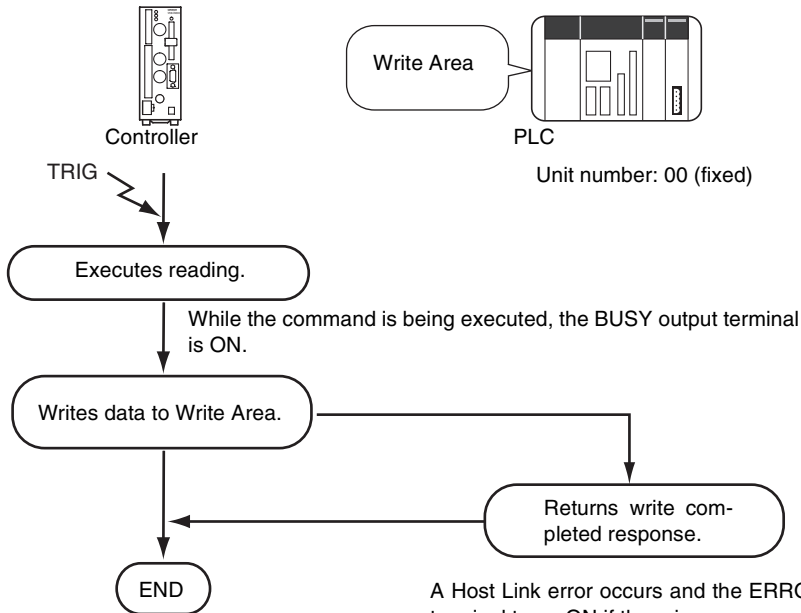
A Host Link error occurs and the ERROR output terminal turns ON if there is no response within 5 seconds. It is assumed that the line is broken or the PLC is not working correctly.



## ■ Inputting TRIG Signal on an Input Terminal

The trigger is used to cause the V530-R2000 to read data and the data is written to the PLC.

**System Set./Com Mode/Read Area to None.**



A Host Link error occurs and the ERROR output terminal turns ON if there is no response within 5 seconds. It is assumed that the line is broken or the PLC is not working correctly. An error message is displayed on the screen.



CHECK!

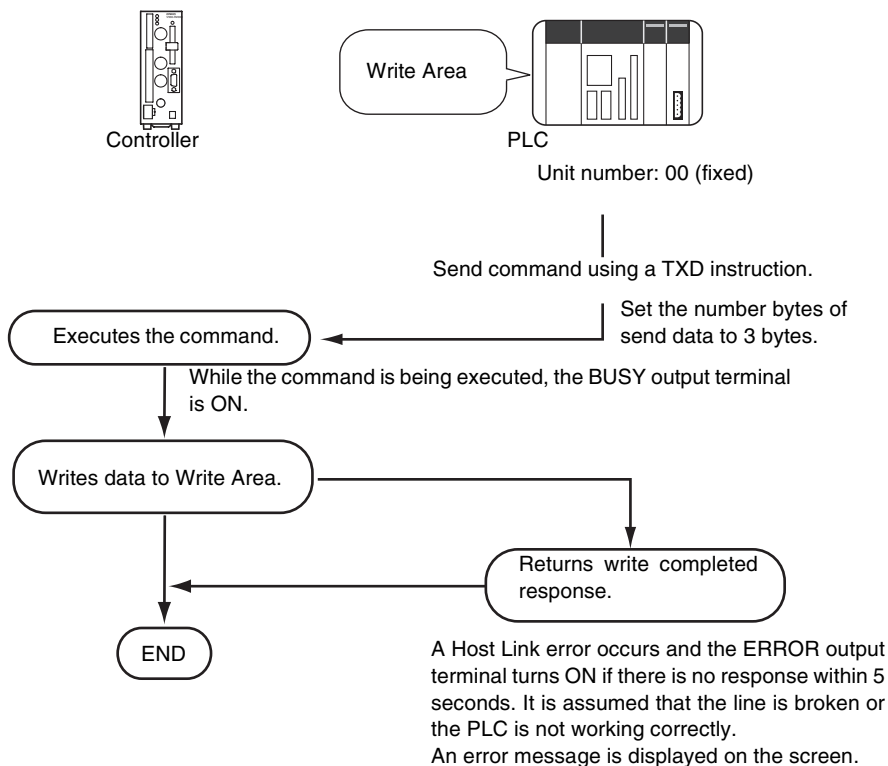
Adjust the timing of the TRIG input considering the image processing time and data output time, allowing sufficient leeway. An error will occur if the next input occurs before communications have been completed.



## ■ Using TXD Instructions

When using the TXD instruction, commands are not set in the Read Area, but are actively sent from the PLC to the Controller.

Set **System Set./Com Mode/Read Area** to **None**.





## ■ Command List

The following commands can be input from the host to the Controller.  
Set the command to be executed in the Read Area.

Command code	Function	Page
0010	Performs one reading.	p.80
0011	Starts continuous reading.	p.80
0012	Stops continuous reading.	p.81
0020	Switches the read condition number to 0.	p.81
0021	Switches the read condition number to 1.	
0022	Switches the read condition number to 2.	
0023	Switches the read condition number to 3.	
0024	Switches the read condition number to 4.	
0025	Switches the read condition number to 5.	
0026	Switches the read condition number to 6.	
0027	Switches the read condition number to 7.	
0028	Switches the read condition number to 8.	
0029	Switches the read condition number to 9.	
0030	Switches the camera number to 0.	p.81
0031	Switches the camera number to 1.	



## ■ Specific Command Formats

Command formats are explained here in order of command codes.

The commands are input in BCD. Set the command in the begin read word in the Read Area.

### 0010: One-shot Reading

**Function** Performs one reading.

Reading ends when the reading is correctly performed (OK).

The reading result is output to the Write Area.

Begin read word	Data				Description
+0	0	0	1	0	Command code

Begin write word	Data				Description
+0	Write Flag	0	0	0	Write Flag
+1	Read data byte 1		Read data byte 2		Read data
+2	Read data byte 3		Read data byte 4		
to	to		to		
+27	Read data byte 53		Read data byte 54		
+28	Read data byte 55		Read data byte 56		



CHECK!

- The Write Flag changes between 0 and F each time data is output. This flag can be monitored to confirm when data has been written. The Write Flag will change to 0 at the first reading after turning ON the power supply, so store F as the initial value.
- There is a limit to the amount of data that can be sent at one time in Host Link Mode. The maximum data quantities for code are as given below. If these limits are exceeded, the portion exceeding the limit will be truncated.
  - Single-byte characters: 56 letters
  - Double-byte characters: 28 letters
- Add a space (ASCII 20) when the number of read data bytes is odd.
- An error code will be output to the +1 word for NG readings.

### 0011: Continuous Reading

**Function** Performs continuous reading.

The reading result is output to the Write Area.

Begin read word	Data				Description
+0	0	0	1	1	Command code

Data output to the Write Area is the same as for the One-shot Reading command (0010).



## 0012: End Continuous Reading

**Function** Stops continuous reading.

Begin read word	Data				Description
+0	0	0	1	2	Command code

## 002\*: Switch Read Condition Number

**Function** Switches the read conditions for the specified read condition number. Replace the asterisk (\*) with the number of the read conditions to use.

Begin read word	Data				Description
+0	0	0	2	*	Command code

## 003\*: Switch Camera

**Function** Switches the Camera to use for reading. Replace the asterisk (\*) with the number of the Camera to use.

Begin read word	Data				Description
+0	0	0	3	*	Command code



## ■ Example of Host Link Connection to PLC



This example describes a connection to a CS1H PLC made by OMRON.

### ■ Settings at the PLC

Set the communications conditions of the Host Link Unit of the PLC or the Host Link port built into the CPU Unit. For details on setting methods, refer to the manual for the PLC.

Item	Setting
Communications method	Host Link
Unit number	01
Baud rate	9600 bps
Data length	7 bits
Parity bit	EVEN
Stop bits	2 bits

### ■ Settings at the Controller

Item		Setting
Communications mode  p.40	Communications mode	Host Link
	Interface	RS-232C
	Read Area	DM
	Begin read word	0100
	Write Area	DM
	Begin Write Word	0110
	PLC Mode Check	ON
Communications conditions  p.42	Baud rate	The same settings as those at the PLC.
	Data length	
	Parity bit	
	Stop bits	



### ■ Programming Example

This programming inputs a One-shot Reading Command to the PLC's DM Area. The V530-R2000 accesses this command and reads the data.

The read data is written to the specified words in the PLC.

---

**1.** Set the read conditions of the V530-R2000 and display the Read Screen.

**2.** Set the command to start reading DM 0100 of the PLC.

---

▼

The V530-R2000 reads the code, writes the Write Flag in DM 0110, and writes the read data to DM Area words beginning with DM 0111.

**3.** Check the Write Flag in DM 0110 in the PLC.

---

▼

If data has been written, the Write Flag will have changed from 0 to F.

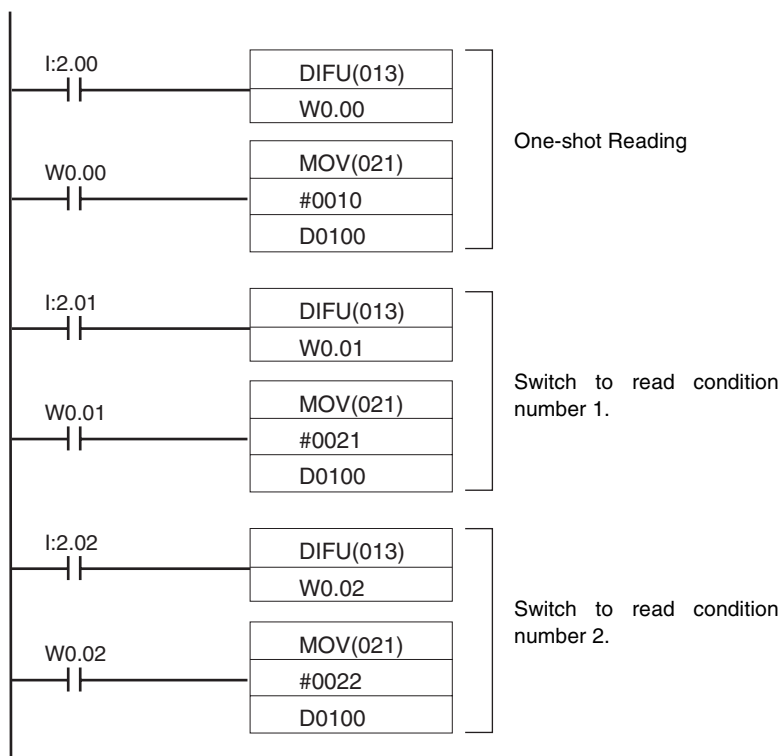


CHECK!

The Write Flag will change to 0 at the first reading after turning ON the power supply, so store F as the initial value.



## ▪ Ladder Programming Example



## ▪ Example of Incorrect Ladder Programming

Bit outputs will not be possible if the Read Area is set to I/O under **System Set./Com Mode** in the Controller and the following type of ladder programming is used.

### Settings at the Controller

Item	Setting
Read Area	I/O
Begin read word	0100
Write Area	DM
Begin Write Word	0110



The read command 0010 will remain set in the Read Area and reading will be executed continuously.

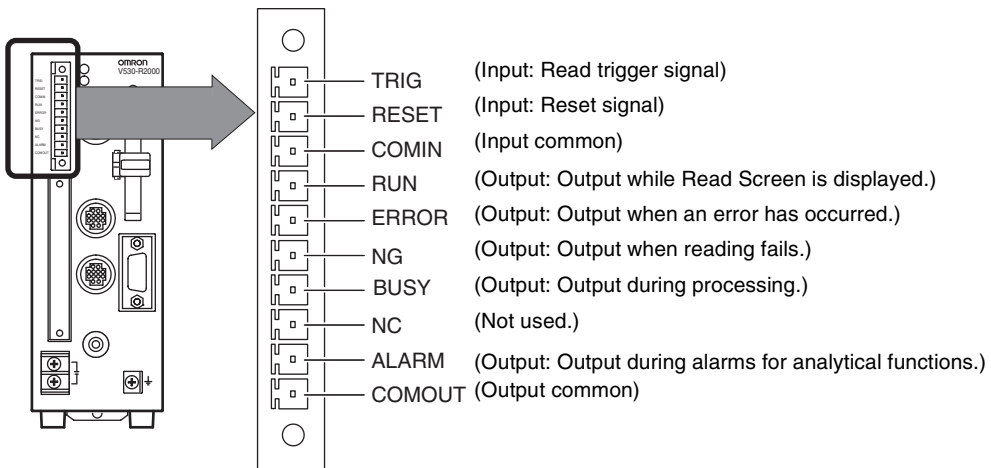


# I/O Terminals

I/O terminals can be used to input read triggers and to output confirmation of reading (NG). This section describes the connection method for terminals. Refer to *SECTION 5 System Settings* for the communications modes used to communicate with the host and the communications settings.

## Wiring Methods

Wire a cable to the enclosed connector and insert the connector into the Controller. The pin layout on the Controller is shown below. Wire only the required terminals.



CHECK!

Do not input the RESET signal immediately after turning ON the power supply. When using the RESET signal to synchronize startup timing, wait for at least 1 second after turning ON the power supply to the Controller before turning ON the RESET signal.



CHECK!

For the COMIN terminal, use a DC power supply with safe extra-low-voltage circuits on the secondary side.

If UL recognition is required for the overall system, use a UL class II power supply.

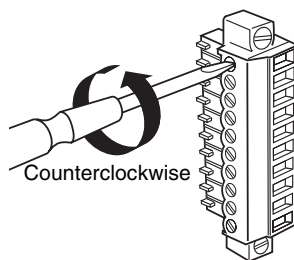
## ■ Recommended wire Size

0.14 to 1.5 mm<sup>2</sup> (AWG16 to AWG25)

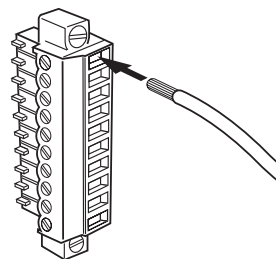
Keep the cable length to less than 30 m.



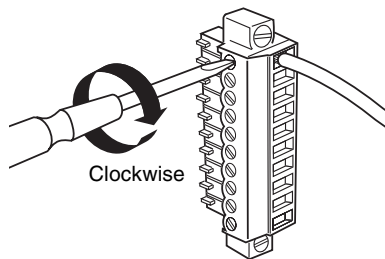
1. Using a flat-blade screwdriver, loosen the screw for the power line on the connector.



- 
2. Insert the power line.



- 
3. Tighten the screw.  
The tightening torque must be between 0.22 and 0.25 N·m.



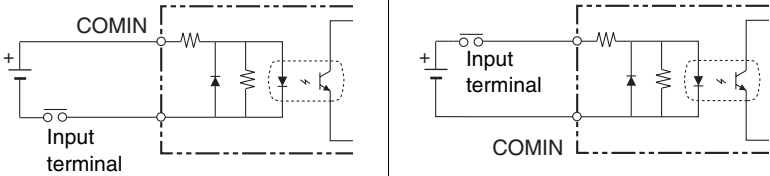
- 
4. Insert the connector into the Controller.

5. Tighten the screws.  
The tightening torque must be between 0.22 and 0.25 N·m.



## Internal Specifications

### Input Specifications

Item	Specifications	
Model	V530-R2000 (NPN)	V530-R2000P (PNP)
Input voltage	12 to 24 VDC $\pm 10\%$	
ON current (See note 1.)	5 to 15 mA	
ON voltage (See note 1.)	8.8 V max.	
OFF current (See note 2.)	0.1 mA max.	
OFF voltage (See note 2.)	4.5 V min.	
ON delay	RESET input: 10 ms max.	
	Other inputs: 0.5 ms max.	
OFF delay	RESET input: 15 ms max.	
	Other inputs: 0.7 ms max.	
Internal circuit diagram		

\*1: ON current/voltage

The current or voltage required to change from an OFF to an ON state. The ON voltage is the difference in electric potential between COMIN and an input terminal.

\*2: OFF current/voltage

The current or voltage required to change from an ON to an OFF state. The OFF voltage is the difference in electric potential between COMIN and an input terminal.





Output Specifications

Item	Specifications	
Model	V530-R2000 (NPN)	V530-R2000P (PNP)
Output voltage	12 to 24 VDC $\pm 10\%$	
Load current	45 mA max.	
ON residual voltage	2 V max.	
OFF leakage current	0.1 mA max.	
Internal circuit diagram		



## I/O Terminals

Terminal		Description
Inputs	TRIG	Input the trigger for reading from an input device such as a photoelectric switch. Keep the TRIG terminal ON for a minimum of 0.5 ms. The interval at which the TRIG can be input depends on the reading time. The BUSY signal is output during read processing, at which time the TRIG input will not be accepted.
	RESET	Resets the Controller.
Outputs	RUN	ON while the Read Screen is being displayed.
	ERROR	 Error Messages p.97
	NG	ON when a reading is NG.
	BUSY	ON while the Controller is processing reading. TRIG inputs and commands will not be accepted while the BUSY signal is ON.
	ALARM	ON when the alarm level is reached (assuming the analytical functions have been enabled).  p.34



CHECK!

Output signals are initially OFF, but they can turn ON during the first 0.5 seconds after the power supply is turned ON. Be sure that signals are not incorrectly read at the host.

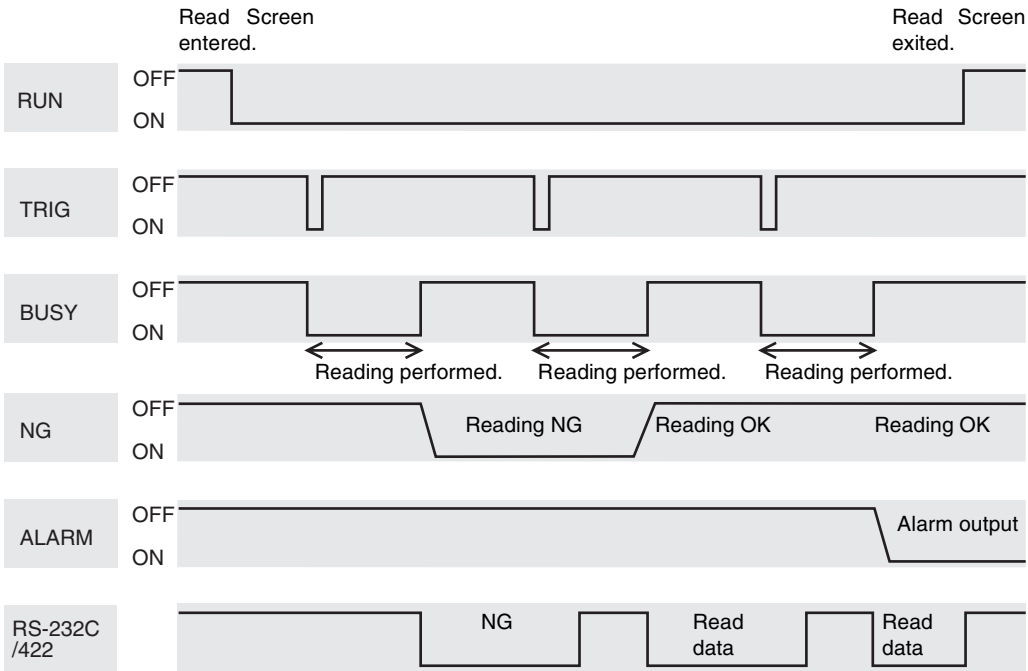


# Timing Charts

## ■ One-shot Triggers

One reading is performed synchronized on the rising edge (OFF to ON transition) of the trigger signal in the I/O terminals. If reading is successful, reading is ended and the reading results is output.

The trigger signal is also synchronized as the camera shutter input to enable taking images of moving workpieces in an accurate position.

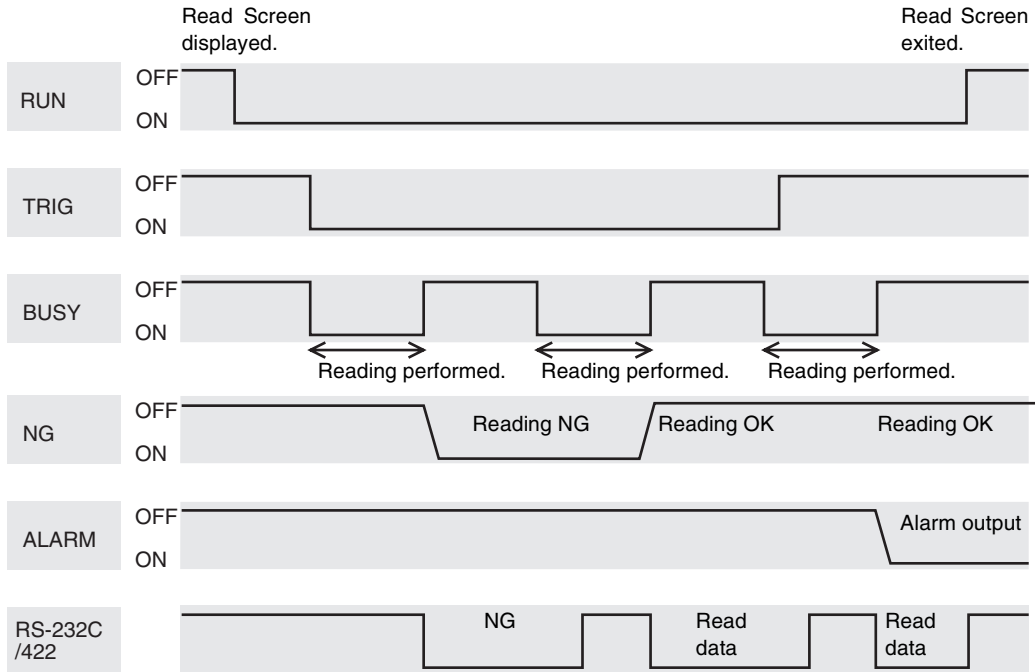


\*The output time to RS-232C/422 changes depending on the data volume and baud rate.



## ■ Continuous Reading Trigger Mode

Reading is performed continuously as long as the trigger signal is ON.



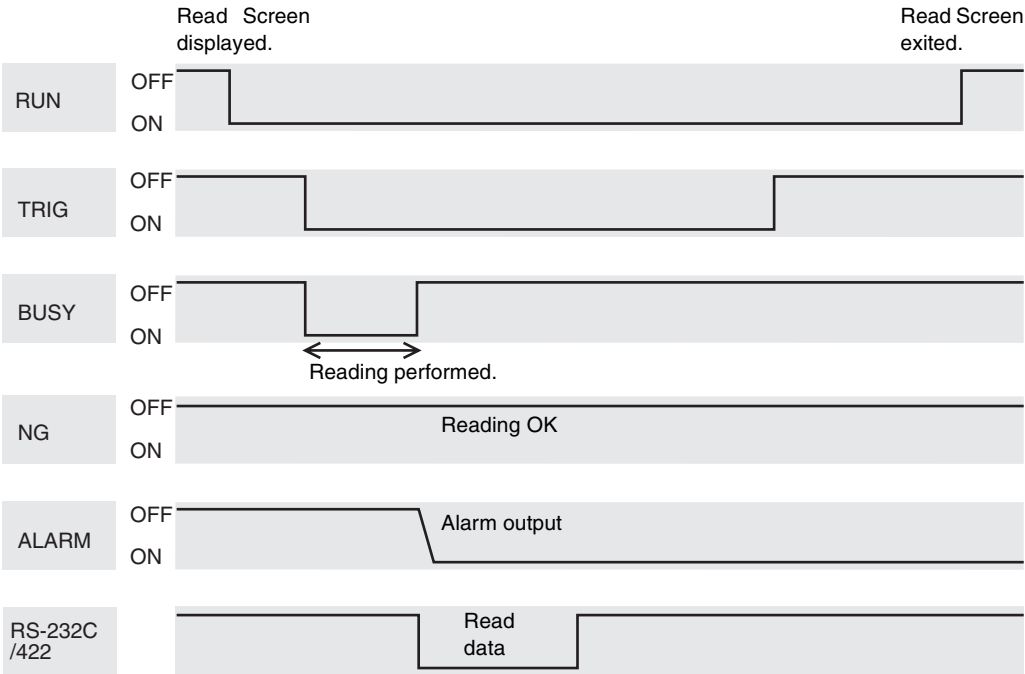
\*The output time to RS-232C/422 changes depending on the data volume and baud rate.



■ Level Trigger Mode

Reading is repeated until successful while the trigger signal is ON. If reading is not performed successfully, **NG** is output when the trigger signal turns OFF.

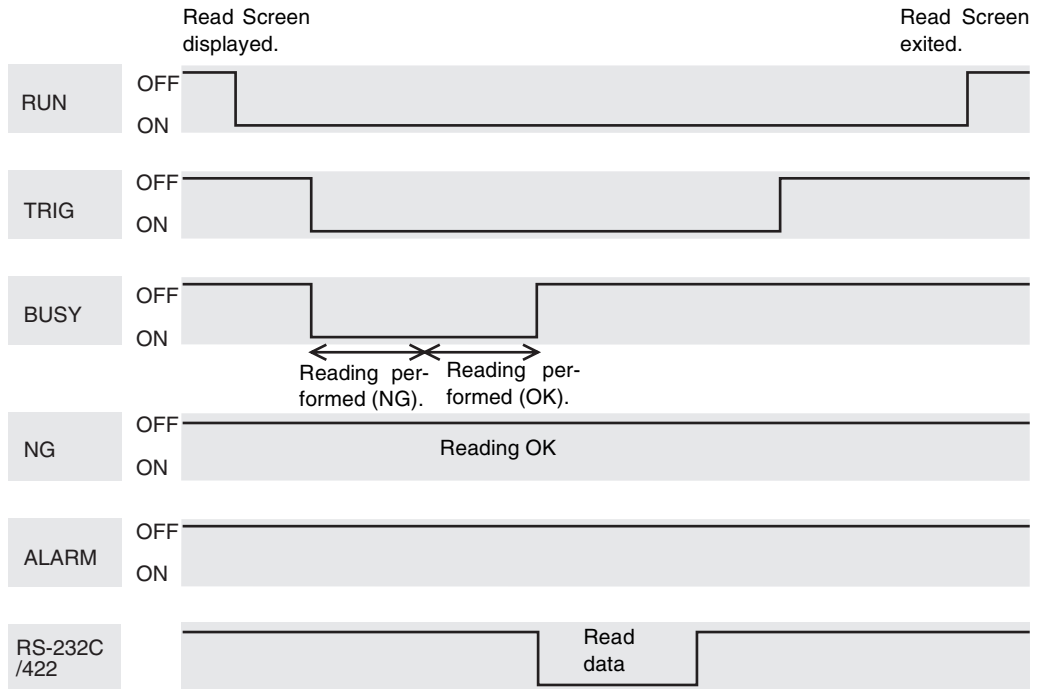
▪ Reading OK



\*The output time to RS-232C/422 changes depending on the data volume and baud rate.

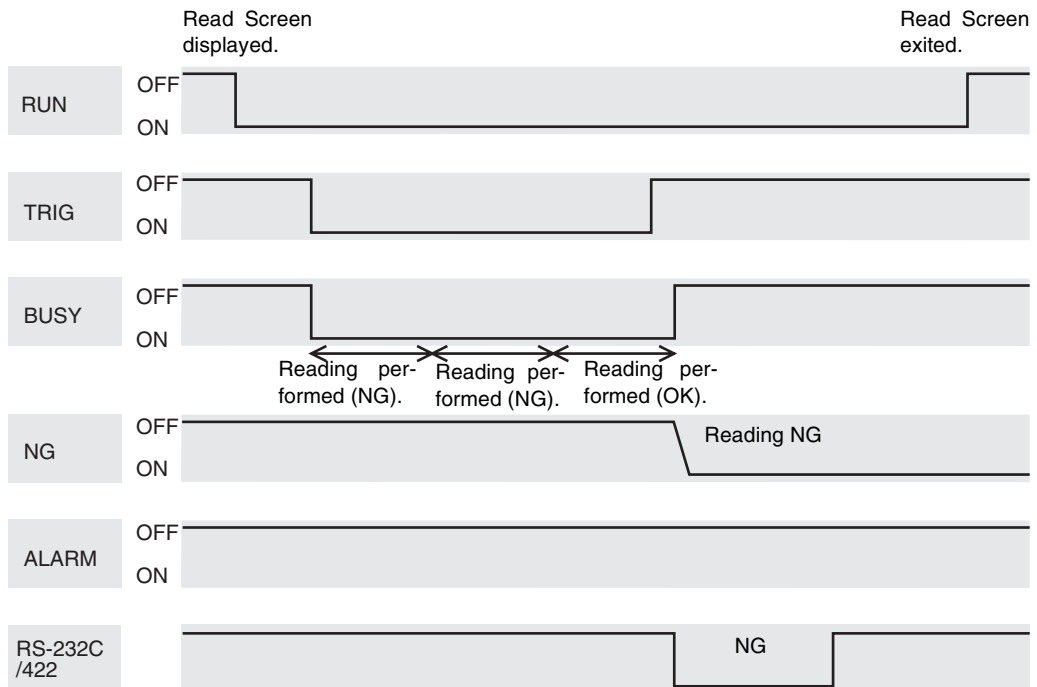


## ▪ Reading OK after Repeated Reading



\*The output time to RS-232C/422 changes depending on the data volume and baud rate.

## ▪ Reading NG after Repeated Reading



\*The output time to RS-232C/422 changes depending on the data volume and baud rate.







MEMO



# SECTION 8

## Troubleshooting

This section explains the countermeasures to take when reading cannot be executed correctly, or when trouble occurs.





 Error Messages and Corrections	96
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 2D Code Checker and Condition Watcher	99



# Error Messages and Corrections

This section lists the error messages displayed on the screen and the measures to take.

 **ERR** The ERROR output terminal will turn ON for the error messages marked with this symbol.

Error message	Measure to take	Reference
Communication error  <b>ERR</b>	End Controller operation and turn OFF the power supply. Then check the following items and try operation again. <ul style="list-style-type: none"> <li>• Is the cable wired correctly?</li> <li>• Are the communications specifications of the Controller the same as those of the host?</li> <li>• Is the host operating correctly?</li> </ul> Reason: Data transfer was cancelled because an error occurred in the communications functions of the host. If the error persists after checking the above, the Controller may be broken. Consult with your OMRON representative.	p. 60 p. 40, p. 42
Host Link error  <b>ERR</b>	Check the following items and then restart the Controller or change the <b>Interface</b> setting under <b>System Set./Com Mode</b> to <b>Host Link</b> . <ul style="list-style-type: none"> <li>• Is the cable wired correctly?</li> <li>• Are the communications specifications of the Controller the same as those of the host.</li> <li>• Is the PLC started?</li> </ul> * The <b>Interface</b> will automatically be returned to <b>Normal</b> when this error occurs.	p. 60 p. 41, p. 42 p. 82
Lack of Memory Card capacity	<ul style="list-style-type: none"> <li>• Delete unnecessary files to create space.</li> <li>• Replace the Memory Card with one with a larger capacity.</li> </ul>	- p. 52
Loaded file format error	<ul style="list-style-type: none"> <li>• There is an error in the format of the data.</li> </ul>	-
Memory Card access error	<ul style="list-style-type: none"> <li>• Mount a recommended Memory Card that has been formatted.</li> </ul>	p. 52
Received data format error  <b>ERR</b>	Select the correct file and try transferring it again. Reason: An incorrect file was selected.	-
The camera is disconnected  <b>ERR</b>	<ul style="list-style-type: none"> <li>• Check the Camera Cable to be sure it is connected and not broken.</li> </ul>	p. 13
The PLC is not in Monitor Mode	<ul style="list-style-type: none"> <li>• Place the PLC into MONITOR mode.</li> </ul>	-

## Error Messages when Reading Fails

Screen message	Measure to take	Reference
2D code is not found	Check a live image to be sure that the 2D code is shown on the screen.	p. 24
2D code is not distinguished	Check the background to see if it is too rough and be sure the 2D code is shown clearly on the screen.	p. 35
Decode error	Check the condition of the mark.	p. 35
	Check the focus and the suitability of the lighting being used.	p. 102
	Execute teaching again.	p. 28
Timeout	Change the <b>Read Timeout</b> setting under <b>System Set./Trigger Mode</b> .	p. 43



## Error Messages and Corrections

The following table lists the error codes displayed on the screen and measures to take when reading fails. The error codes are listed in numerical order.

Error code	Message displayed on screen	Measure to take
E100	2D code is not found	There may not be a 2D code in the field of vision. Check the positioning and mark and be sure they are correct.
E200	2D code is not distinguished	The background may be not be consistent, making it impossible to find the 2D code. Check the surface of the workpiece and the condition of the lighting.
E300	Decode error	The cells of the 2D code cannot be discerned. Check the condition of the mark and the lighting, and then try teaching again.
E400	Timeout	Reading was not completed within the set time. Check the surface of the workpiece and the condition of the lighting, and then try teaching again. Increase the setting of the <b>Read Timeout</b> setting.

## Troubleshooting



### Connection Errors

Status	Measure to take	Reference
The POWER indicator is not lit.	• The power supply is not connected properly.	p. 15
The Video Monitor image is not clear.	• The Monitor Cable is not connected properly.	p. 13
Cannot make key inputs on the Console.	• The Console Cable is not correctly connected.	p. 13
Camera images are not displayed when using a Camera and CCTV Lens.	• The lens cap is on the lens. • The Camera Cable is not properly connected.	- p. 13
Camera images are not displayed when using a Reading Head.	• The Cable is not connected. • The correct Reading Head is not selected for the Camera <b>Use Type</b> setting under <b>System Set./Camera/Lighting</b> .	p. 13 p. 45
The code is not displayed on the screen.	• Press the <b>ESC</b> Key on the Console to switch to a live image, or move to Teaching Mode and check the image.	p. 24 p. 28
The menu is not displayed.	• Press the <b>ENT</b> Key on the Console.	p. 25



## Reading Operation

Status	Measure to take	Reference
Teaching was successful but reading is not possible.	<ul style="list-style-type: none"> <li>Are the conditions of the code being read the same as those for teaching? <ul style="list-style-type: none"> <li>Code type</li> <li>Symbol size</li> <li>Mirror Status</li> <li>Symbol Color</li> </ul> </li> <li>Check the teaching image.</li> </ul>	p. 28

## I/O Terminals

Status	Measure to take	Reference
There is no response for the signals from input terminals.	<ul style="list-style-type: none"> <li>Signal lines are not wired correctly.</li> <li>Check the TRIG input status from the Condition Watcher.</li> </ul>	p. 85
Signals are not output from output terminals.	<ul style="list-style-type: none"> <li>Signal lines are not wired correctly.</li> </ul>	p. 85

## Serial Interface

Status	Measure to take	Reference
Communications are not possible.	<ul style="list-style-type: none"> <li>The cable is not properly connected.</li> <li>The communications specifications are not correct.</li> <li>The communications mode is not correct.</li> </ul>	<p>p. 60</p> <p>p. 42</p> <p>p. 40</p>
Need to know the communications status.	<ul style="list-style-type: none"> <li>Display the 2D Code Checker.</li> <li>The communications status is displayed at the bottom of the monitor screen.</li> </ul>	p. 35

## ALM Display

Status	Measure to take	Reference
ALM is displayed.	<ul style="list-style-type: none"> <li>Check the comment and correct the situation.</li> <li>Execute teaching again.</li> </ul>	<p>p. 99</p> <p>p. 28</p>



## 2D Code Checker and Condition Watcher

These functions show quantitatively how much leeway there is in the ability to take readings and whether the suitable lighting and lens have been selected. These functions are not displayed if a 2D code cannot be read. If reading is not possible, check the messages displayed on the image monitor and use them to correct the system.

### Comments and Countermeasures when Reading Fails

Display mode	Message	Measure to take
2D Code Checker (ALM is displayed.)	Likely wrong lighting selection	The contrast is too low and the situation is unlikely to be corrected by changing the brightness of the lighting or the aperture of the lens. Try changing the direction or color of the lighting.
	Make lighting brighter	The contrast is low and the white portions are dark. Increase the lighting or open the aperture of the lens.
	Make lighting darker	The contrast is low and the black portions are light. Decrease the lighting or close the aperture of the lens.
	Teach again.	The shutter speed may be incorrect. Try teaching again.
	Too many misidentified Cells	The marked portion of the 2D code shown on the screen cannot be discerned. Check the condition of the mark.
	Likely defocusing	Adjust the working distance or the focus of the lens.
	Set 2D code center of view	Follow the message.
	Need to make the Cell size larger	The dot size is too small. Decrease the field of vision or increase the mark size of the 2D code.
	Need to zoom out	The code is too large for the field of vision. Increase the field of vision or decrease the size of the mark for the 2D code.
2D Code Checker (When reading fails)	2D code is not found	No shape thought to be a 2D code can be found in the field of vision. Check the screen to be sure a 2D code is in the field of vision.
	2D code is not distinguished	There are too many shapes in the field of vision that could be 2D codes, so reading is not possible. Consider making a consistently plain background for the 2D code.
	Decode error	The 2D code is of a format not supported by the 2D Code Reader.
	Timeout	The read time set for the <b>Read Timeout</b> was exceeded, causing reading to be ended. Change the time set for the Read Timeout.



Display mode	Message	Measure to take
Condition Watcher	Scattered lighting power	There may be large inconsistencies in the angles of the workpieces. Check the workpieces. The timing between lighting and the trigger may be off. Adjust the timing.
	Scattered working distance	The distance between the lens and the workpiece is not consistent. Check the workpieces.
	Scattered marking condition	There are too many cells that cannot be discerned. Check the marks to be sure they are suitable.
	Scattered 2D code Location	The 2D codes are not positioned consistently in the field of vision. Check the positions of the marks.
	After the following alarm messages are displayed, it may no longer be possible to take readings after another 5,000 readings have been taken. Read the message and take appropriate measures accordingly.	
	Lighting power declination	The lighting may be becoming lighter or darker. Check the lighting.
	Working distance displacement	The focus is off. Check the distance between the lens and the workpieces and check the focus of the lens.
	Marking condition degradation	The number of cells that cannot be discerned is increasing. Check the condition of the mark of the 2D code.
	2D code location displacement	The 2D is leaving the field of vision. Check positioning.

## Condition Watcher Alarm Output

Appraisal points for the 2D Code Checker are appraised statistically in the following two ways.

### 1. Inconsistency Appraisal

The standard deviation of a specific number of readings is calculated and an alarm is output and displayed when the following equation is met:

$$(\text{Average}) - 3 \times (\text{Standard deviation}) \leq 0$$









### 2. Temporal Appraisal

A moving average is taken of a specific number of readings and an alarm is output and displayed when the slope of the change in the average value shows that the value will reach 0 after 5,000 readings.



# SECTION 9

## Appendix

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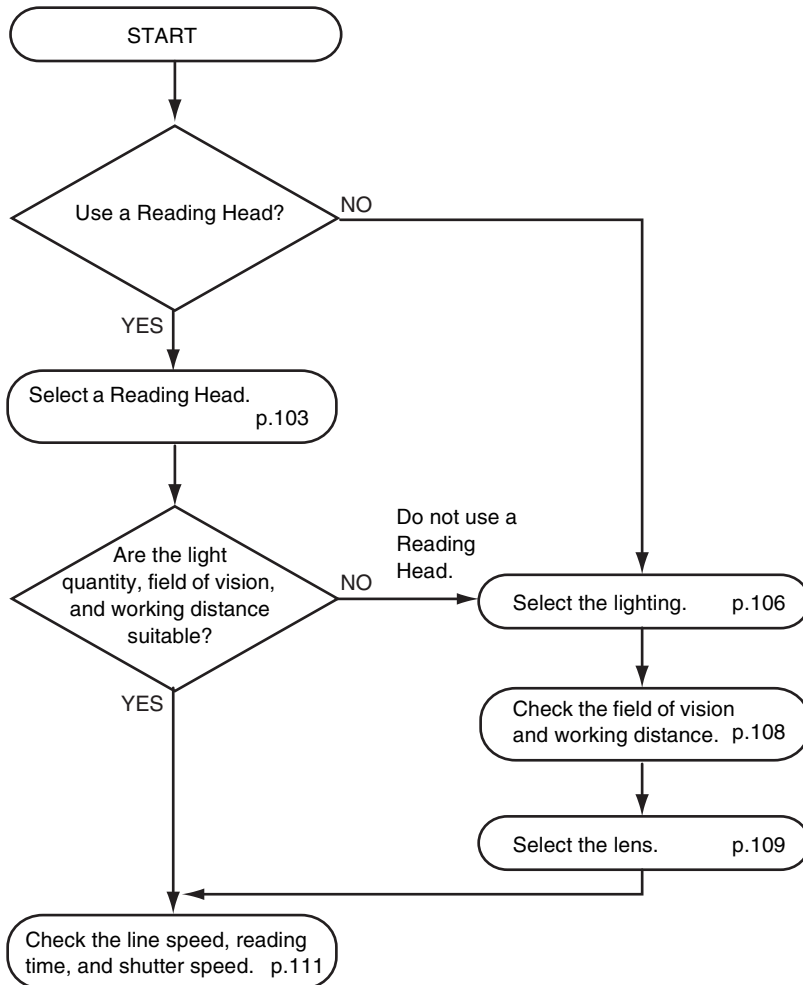


## Lens and Lighting

This section describes how to select lighting, determine the field of vision, and select the Camera and Lens to ensure accurate reading of codes.

If there is leeway in the installation, try a Reading Head first.

### ■ Selecting the Lens and Lighting





## Using a Reading Head

A Reading Head is equipped with LED lighting and manual-zoom lens so that the field of vision can be changed within a specific range. By setting the model of Reading Head under **System Set./Camera/Lighting**, the optimum lighting direction for the V530-L2001 and the optimum lighting color for the V530-L2003 will be selected automatically when teaching.

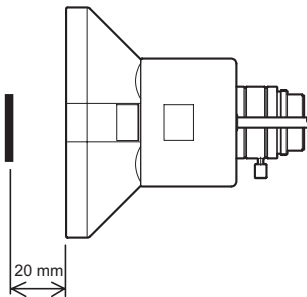


When using a Reading Head, always attach the Reading Head before teaching.

### ■ V530-L2001 Reading Head with Oblique/Coaxial Lighting

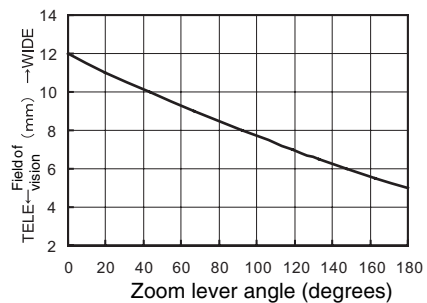
This Reading Head shines light from nine directions. The direction of the lighting is automatically selected when teaching.

#### Working Distance



#### Field of Vision

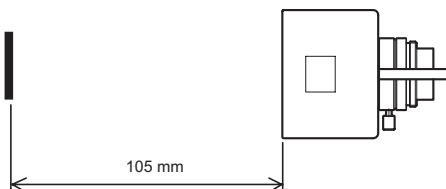
Field of Vision-Zoom Lever Angle Chart 1



### ■ V530-L2002 Reading Head with Ring Lighting

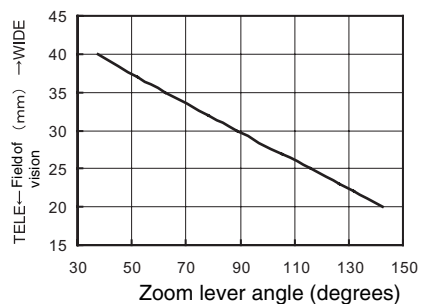
With this Reading Head, lighting is positioned in a ring. It is suitable for relatively large codes marked on metal surfaces or codes marked on substrates. It's also suitable for reading codes printed on paper or stickers.

#### Working Distance



#### Field of Vision

Field of Vision-Zoom Lever Angle Chart 1





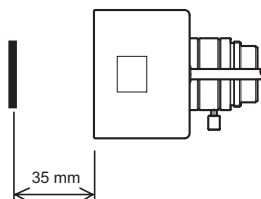
## ■ V530-L2003 Reading Head with V-type Lighting

With this Reading Head, the optical system and imaging system are positioned in a V shape. This makes it suitable for reading codes marked on mirrored surfaces.

The lighting color is automatically selected from white, blue, green, and red.

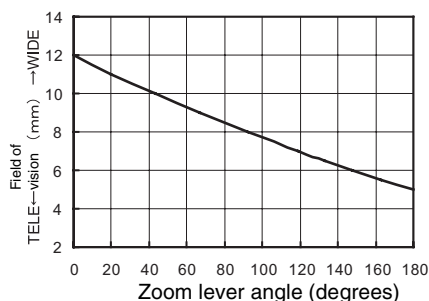
This enables taking relatively good images under conditions that are traditionally very difficult to read image under, such as with the effects of thin metal films.

### Working Distance



### Field of Vision

Field of Vision-Zoom Lever Angle Chart

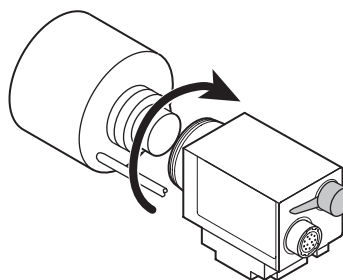


## ■ Connecting to the Camera

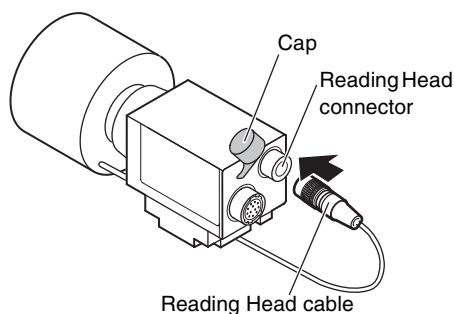
1. This section shows how to connect a Reading Head to a Camera.



Do not subject the Camera to unnecessary force.



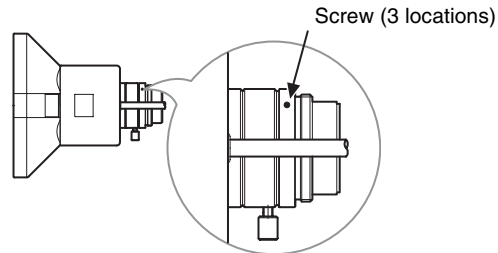
2. Remove the cap from the Reading Head connector and connect the Reading Head cable.





## ■ Mounting the Reading Head

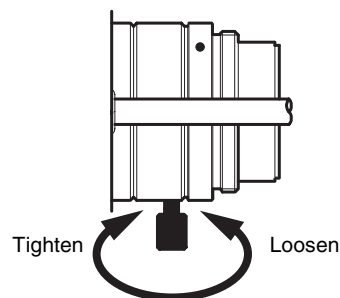
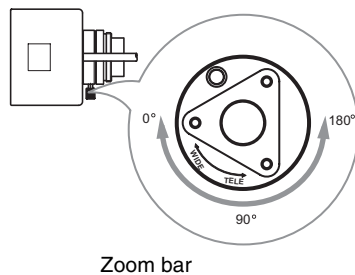
Align the direction of the lighting with the workpiece, loosen the three screws with the enclosed Allen wrench, change the direction, and then retighten the screws. Do not allow the Reading Head to fall when loosening the screws. Also, be sure to tighten the screw sufficiently. If they are not tight, the direction of the lighting may change, the Reading Head may fall, or it may be difficult to connect to or disconnect from the C mount.



The focal point of the zoom lens is fixed. There are differences in the position of the CCD that create differences in the focal point for each Camera. Mount the Camera so that the installation distance can be adjusted in the direction of the optical axis.



Tighten the zoom bar so that the set field of vision does not change.



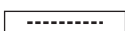




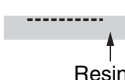





## Not Using a Reading Head

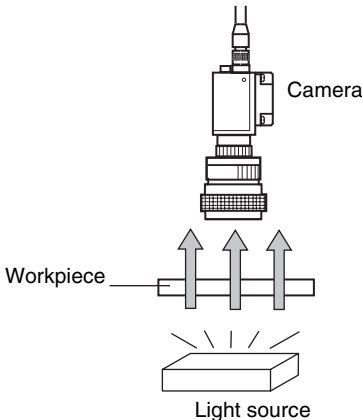
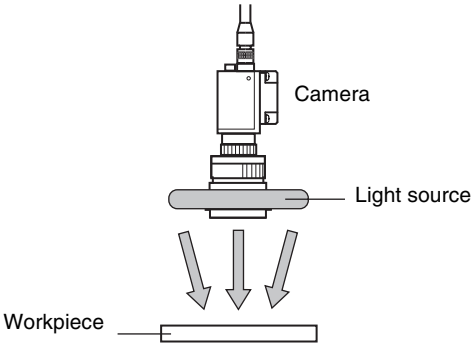
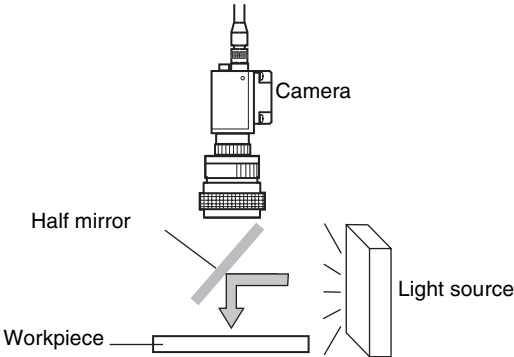
If using a Reading Head cannot provide the required field of vision or working distance or if the amount of light is insufficient, use the following information to select the lighting and lens.

### Selecting the Lighting

Material	Processing	Description	Cross-section	External lighting	Precautions
Transparent material	Metal deposition	Codes formed by metal disposition on a transparent material	 Transparent material	Through lighting Coaxial lighting	Make background darker.
	Front surface scribed	Codes formed by carving the front surface of a transparent material		Coaxial lighting	
	Inner marking	Codes formed inside a transparent material		Ring lighting	
	Back surface scribed	Codes formed by carving the back surface of a transparent material		Ring lighting	
Wafers	-	Codes formed on the surface of wafers by laser, e.g., SEMI-T7	 Wafers	-	-
Metal	Mirror surface (processed)	Codes formed by laser or other method on cut or polished surfaces	 Metal	Ring lighting	-
	Rough surface (cast surface)	Codes formed by dot peen marking or other method on cast surfaces		Ring lighting	-
Plated or painted surface	-	Codes formed by removing metal plating, resin, or other coating with a laser or other method	-	Ring lighting	-
Resin	Colored surface	Codes formed by using a laser to change the color of a resin	 Resin	Ring lighting	-
Substrate	Peeled resist surface	Codes formed by removing resist from a substrate with a laser or other method		Ring lighting	-



External Lighting

Lighting method	Description
Through lighting	<p>Provides high contrast resulting in stable images.</p>  <p>The diagram shows a camera positioned above a workpiece. Three vertical arrows point upwards from a light source at the bottom through the workpiece towards the camera. The light source is a rectangular block with lines radiating from its top surface.</p>
Ring lighting	<p>Provides consistent lighting.</p>  <p>The diagram shows a camera positioned above a workpiece. A light source, represented by a ring, is located between the camera and the workpiece. Three arrows point downwards from the ring light source onto the workpiece.</p>
Coaxial epi-lighting	<p>Reduces shadows from unevenness in the workpiece surface resulting in stable images.</p>  <p>The diagram shows a camera positioned above a workpiece. A half mirror is placed at a 45-degree angle between the camera and the workpiece. A light source is positioned to the right, with an arrow showing light reflecting off the half mirror and pointing directly down at the workpiece.</p>

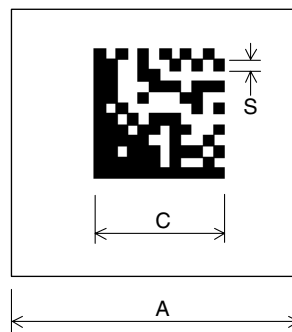


## ■ Setting the Field of Vision and Working Distance

Use the following formula to calculate the field of vision and working distance.

$$(\text{Code size: } C) + 2 \times (\text{Cell size: } S) < (\text{Field of vision: } A) < 121 \times (\text{Cell size: } S)$$

Effective number of Camera pixels	512 (H) × 484 (V)
Code size	C (mm)
Symbol size	M X M
Cell size	S (mm) = C/M Four pixels are required per cell. A margin of about the size of one cell is required.
Field of vision	Max.: A (mm) = S/4 × 484 Min.: A (mm) = C + S × 1 × 2



Taking the positioning accuracy of the workpiece in account, set a suitable field of vision.

Example: In this example, the code size is 3 mm and the symbol size is 12 × 12.

- Cell size:  $S = 3/12 = 0.25$  mm
- Maximum field of vision:  $0.25 \times 121 = 30.25$  mm
- Minimum field of vision:  $3 + 0.25 \times 2 = 3.5$  mm

If the positioning accuracy is  $\pm 5$  mm, set the field of vision to from 13.5 mm to less than 30.25 mm.



## ■ Selecting the Lens

Select the lens based on the required field of vision and the distance required between the workpiece and lens (i.e., the working distance).

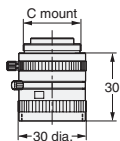
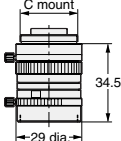
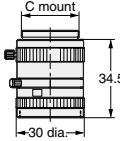
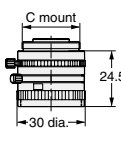
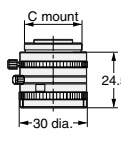
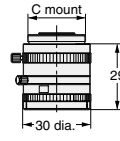
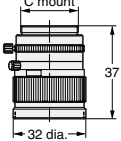
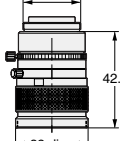
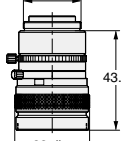
- The brightness will be reduced if an extension tube is used.
- The depth of field will increase if the working distance is increased.
- There are differences between individual Cameras, so make sure that the distance can be adjusted during installation.

## ■ CCTV Lenses

The following Moritex lenses are recommended.

\*Refer to the following website for details on Moritex products. <http://www.moritex.co.jp/>

### CCTV Lenses and Appearances

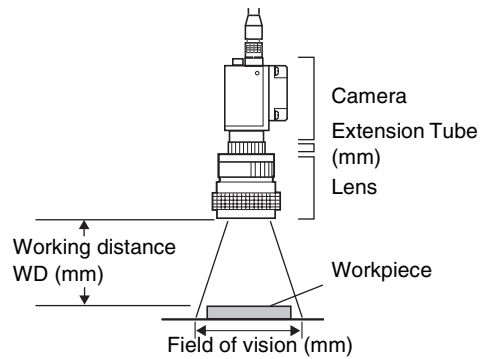
CCTV Lenses					
Model	ML-0614	ML-0813	ML-1214	ML-1614	ML-2514
Dimensions					
Lock structure	Lock structure on focus and aperture				
Mount	C mount				
Model	ML-3519	ML-5018	ML-7527	ML-10035	
Dimensions					
Lock structure	Lock structure on focus and aperture				
Mount	C mount				

### Extension Tubes

Model	Contents
ML-EXR (from Moritex)	A set of 7 extension tubes that are 0.5, 1, 2, 5, 10, 20, and 40 mm in length.



The optical chart provides the field of vision in millimeters and the working distance WD in millimeters when each of the tubes is mounted.



(Unit: mm)

Extension Tube (mm)	ML-0614		ML-0813		ML-1214		ML-1614		ML-2514		ML-3519		ML-5018		ML-7527		ML-10035	
	Field of vision	WD	Field of vision	WD	Field of vision	WD	Field of vision	WD	Field of vision	WD	Field of vision	WD	Field of vision	WD	Field of vision	WD	Field of vision	WD
0	124.0	200.0	72.0	147.7	77.0	247.7	81.8	357.8	64.9	457.7	49.1	500.0	67.6	943.0	45.0	1000.0	34.8	1000.0
0.5	44.6 32.8	63.2 43.0	57.4 31.9	115.2 59.0	89.1 41.3	289.2 125.0	116.7 48.1	514.6 206.1	181.2 47.8	1270.0 338.2	251.4 41.1	2458.7 422.1						
1	22.3 18.9	24.8 19.0	28.7 20.5	51.8 33.7	44.6 28.2	135.9 80.0	58.4 34.1	251.8 142.8	90.6 37.8	636.5 268.5	125.7 35.3	1240.0 366.1						
1.5			19.1 15.1	30.6 21.7	29.7 21.4	84.9 56.7	38.9 26.4	164.2 108.2	60.4 31.3	425.3 222.8	83.8 31.0	833.8 323.9	115.1 42.6	1576.5 609.9				
2					22.3 17.3	59.3 42.4	29.2 21.5	120.3 86.3	45.3 26.7	319.7 190.6	62.8 27.6	630.7 290.9	86.3 37.9	1193.0 547.6	138.2 32.3	3188.9 776.1		
5							11.7 10.2	41.5 35.4	18.1 14.2	129.6 103.1	25.1 16.6	265.1 184.8	34.5 22.9	502.6 347.0	55.3 22.6	1421.7 607.0	71.3 20.5	2412.7 724.2
10							5.8 5.4	15.2 14.0	9.1 8.0	66.3 59.6	12.6 10.0	143.2 120.6	17.3 13.8	272.5 225.7	27.6 15.1	832.7 474.7	35.7 14.3	1431.6 608.6
15									6.0 5.5	45.2 42.7	8.4 7.2	102.6 93.0	11.5 9.8	195.8 173.5	18.4 11.4	636.3 408.4	23.8 11.3	1104.6 545.7
20									4.5 4.2	34.6 33.6	6.3 5.6	82.2 77.6	8.6 7.7	157.5 144.5	13.8 9.1	538.2 368.5	17.8 9.2	941.0 505.3
25											5.0 4.6	70.1 67.8	6.9 6.3	134.4 126.0	11.1 7.6	479.2 341.9	14.3 7.8	842.9 478.1
30													5.8 5.3	119.1 113.1	9.2 6.5	440.0 322.8	11.9 6.7	777.5 457.6
35													4.9 4.6	108.1 103.7	7.9 5.7	411.9 308.5	10.2 5.9	730.8 442.6
40													4.3 4.1	99.9 96.5	6.9 5.1	390.9 297.4	8.9 5.3	695.8 430.1
45															6.1 4.6	374.5 288.5	7.9 4.8	668.5 420.7
50															5.5 4.1	361.4 281.3	7.1 4.4	646.7 412.3
60																	5.9 3.7	614.0 400.1

Source: Lenses, lighting, and peripheral devices for image processing catalog from Moritex

**Note:** The values provided are computational and may vary from measured values. Use these values as guidelines only.



# Line Speed, Reading Time, and Shutter Speed

Observe the following precautions when reading moving workpieces.

- Always set the Display Mode to still images.
- With live images, the trigger can be delayed by up to 16.6 ms.

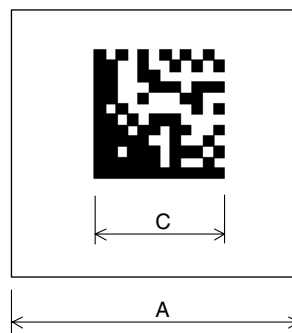
## Shutter Speed

Use the following formula to set the lower limit of the shutter speed to eliminate image motion and enable stable reading.

$$(\text{Shutter speed: } T) \leq \frac{(\text{Allowable motion: } W)}{(\text{Maximum line speed: } V)}$$

$$W \leq 0.1 \times \frac{(\text{Code size: } C)}{(\text{Symbol size: } M)}$$

Shutter speed	T (s)
Code size	C (mm)
Symbol size	M
Field of vision	A (mm)
Number of image pixels in direction of motion	N
Pixels per cell	$n = (C \times N) / (A \times M) *1$
Allowable motion	$W = C / M \times 0.1 \text{ (mm)} *2$
Reading time	R (s)
Code interval	L (mm)
Line speed	V (mm/s)



\*1: To allow leeway, the number of pixels per cell should be greater than 4.

\*2: The allowable motion is 10% of the cell size.

Example: For  $V = 60 \text{ mm/s}$ ,  $C = 1.6 \text{ mm}$ ,  $M = 16$ ,  $A = 10 \text{ mm}$ ,  $N = 512$ ,  $R = 300 \text{ ms}$ ,  $L = 30 \text{ mm}$

As shown below, there will be no problem in reading.

$$n \leq \frac{1.6 \times 512}{(10 \times 16)} = 5.12 > 4$$

The lower limit of the shutter speed is as follows:

$$T \leq \frac{0.1 \times 1.6}{(16 \times 60)} = \frac{1}{6000} \text{ s}$$





If the shutter speed does not meet the following conditions, image motion will have a negative effect on reading.

$$T \leq \frac{W}{V} = \frac{0.1 C}{(MV)}$$

To set a minimum shutter speed to read moving workpieces, perform teaching after setting the lower limit of the shutter speed under **System Set./Camera/Lighting**.



p.45

## Reading Time

The reading time can be calculated using the following formula.

$$(\text{Reading time: } R) \leq \frac{(\text{Code interval: } L)}{(\text{Maximum line speed: } V)}$$

The 2D Code Checker can be displayed to check the reading time on the screen.

The time displayed by the 2D Code Checker, however, includes processing time, so the time will be longer than normal.

If the reading time does not satisfy this equation, the code will not be in the field of vision even if the speed code satisfies conditions, and reading will not be possible.

Example: For a line speed of 60 mm/s and a code interval of 30 mm

$$R \leq \frac{30}{60} = 0.5 \text{ s} = 500 \text{ ms}$$

Thus, reading will not be possible unless the reading time is 500 ms or less.

If the reading time is longer than 500 ms, then either the line speed will need to be reduced or the code interval will need to be increased.



# Maintenance

## Replacing the Battery

The V530-R2000 contains a Battery that backs up the time and date information. When the Battery is nearly discharged, the message “BATTERY LOW” will be displayed at startup. Replace the battery with an OMRON 3Z49-BAT1 Battery. Dispose of the spent Battery properly.

Model
3Z49-BAT1



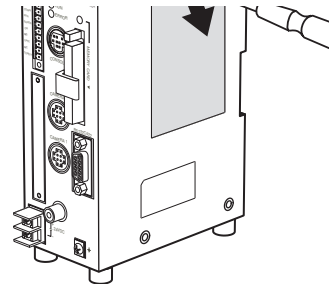
Always turn OFF the power supply before replacing the Battery.

The V530-R2000's clock will be reset if the new Battery is not connected within 2 minutes of removing the spent Battery.



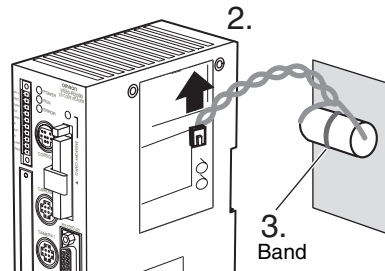
1. Open the battery cover on the side of the V530-R2000.

The cover can be opened with a small flat-blade screwdriver.



The Battery is mounted to the inside of the battery cover.

2. Hold the battery connector by its base and disconnect it.
3. Cut the band that holds the Battery and remove the Battery from the cover.



4. Reverse steps 1. through 3. to install the new Battery.

Use the new band included with the new Battery to attach it to the battery cover.



### WARNING

The lithium battery may combust, explode, or burn if not handled properly. Do not short circuit, attempt to charge, disassemble, apply pressure that would deform to, or incinerate the lithium battery.





## Handling Reading Heads

The Camera and Reading Head are optical components. Handle them with care. Images will be negatively affected if the Reading Head or Camera is dirty or cracked, possibly preventing reading.

- Do not touch the lens, mirror surface, or surface of the lighting cover with your fingers or any pointed object.
- Use the Reading Head in an environment free of dust. If the lens, mirror surface, or surface of the lighting cover becomes dirty, use a lens cloth or air brush to clean them.
- When mounting the Reading Head to the Camera, do not touch the imaging surface of the CCD on the Camera or get it dusty.

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## Regular Inspections

To maintain the V530-R2000 in the best condition, perform the following regularly.

- Clean the Lens and LED indicators with a lens cloth or blow off dust with an air brush.
- Lightly wipe off dirt with a soft cloth.

Inspection point	Details	Tools required
Power supply	The voltage measured at the power supply terminals on the terminal block must be between 20.4 VDC and 26.4 VDC.	Circuit tester
Ambient operating temperature	The ambient operating temperature inside the cabinet must be between 0 and 50°C.	Thermometer
Ambient operating humidity	The ambient operating humidity inside the cabinet must be between 35% and 85%.	Hygrometer
Installation	Each cable connector must be correctly inserted and locked. The Cameras must be firmly secured. The camera lens mounts must be firmly secured.	Screwdriver



CHECK!

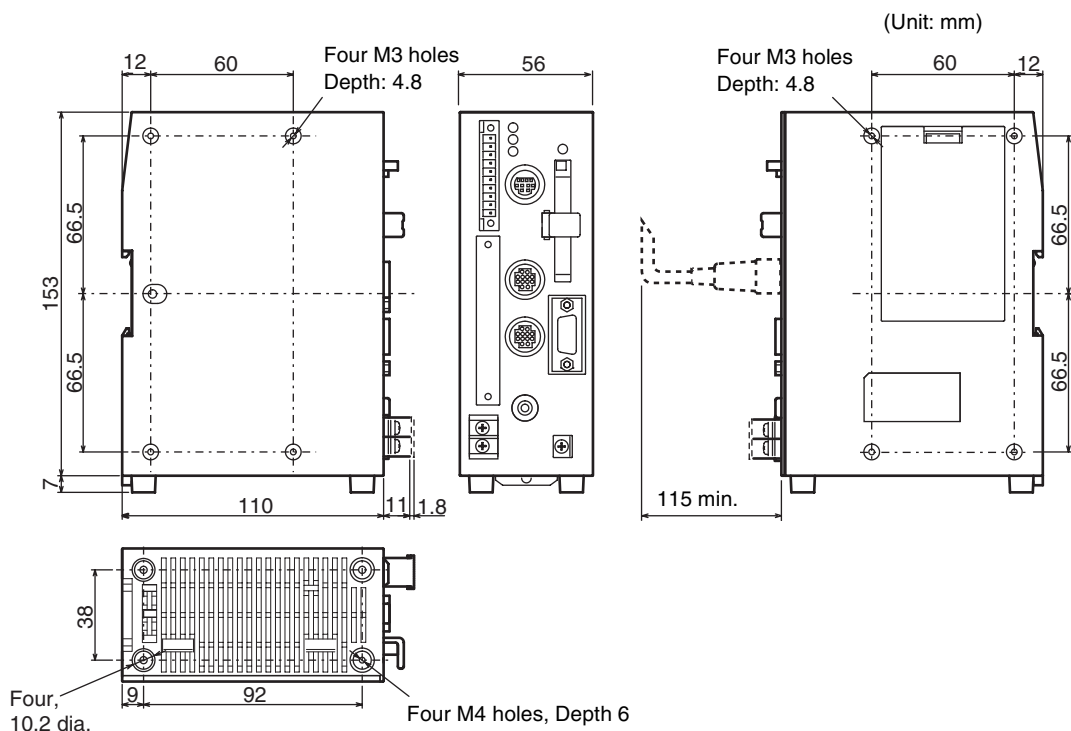
- Turn OFF the power and take safety precautions before conducting inspections.
- Do not use thinners or benzene.



# Specifications and Dimensions

## Controller

### V530-R2000



## General Specifications

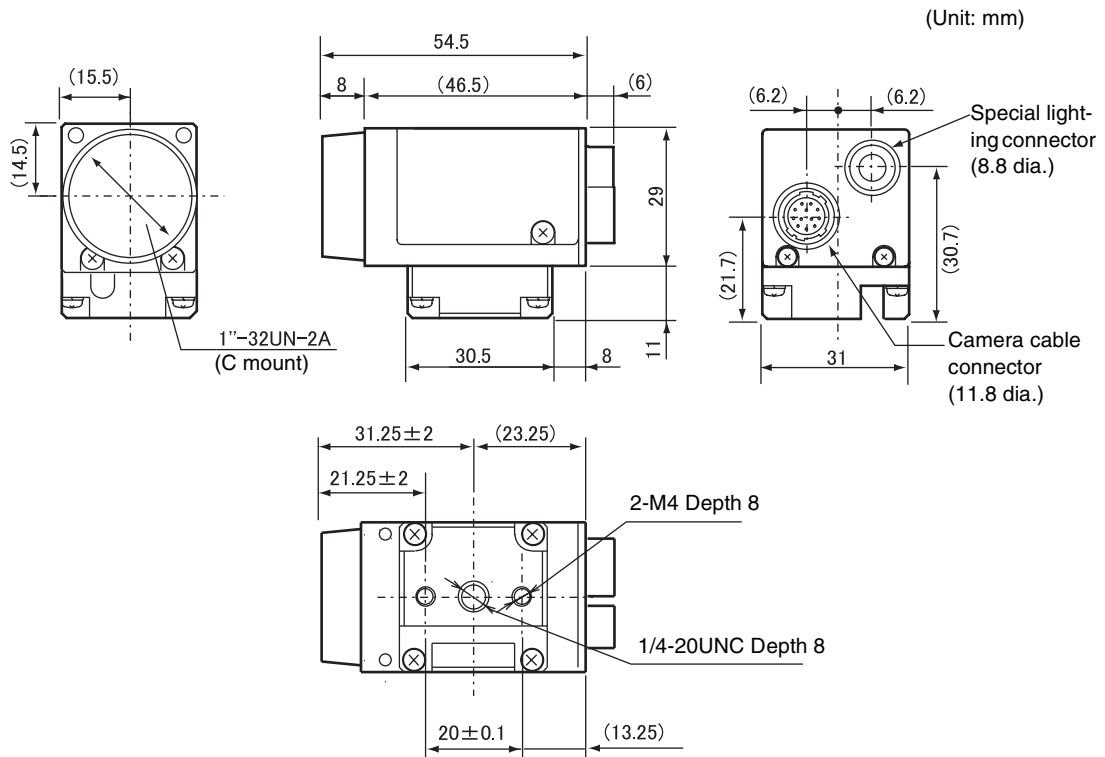
Model	V530-R2000	V530-R2000P
I/O type	NPN	PNP
Power supply voltage	20.4 to 26.4 VDC	
Current consumption	1.6 A max.	
Camera	F160-S2-2D 2 max.	
Console	F150-KP-2D	
Inputs	Trigger, reset	
Input specifications	12 to 24 VDC $\pm 10\%$ , ON current: 5 to 15 mA, ON voltage: 8.8 V max., OFF current: 0.1 mA max., OFF voltage: 4.5 V min.	
Monitor output	NTSC composite video output	
Outputs	RUN, ERROR, BUSY, NG, ALARM	
Output specifications	12 to 24 VDC $\pm 10\%$ , Load current: 45 mA max., ON residual voltage: 2 V max., OFF leakage current: 0.1 mA max.	
Functions	Teaching, code checking, monitoring function, Memory Card backup function	
Applicable codes	DataMatrix ECC200 $10 \times 10$ to $64 \times 64$ , $8 \times 18$ to $16 \times 48$ QR Code (Model 1 or 2) version 1 to version 10	
Operating method	Console or communications commands	
Settings	Teaching or selecting conditions	



Model	V530-R2000	V530-R2000P
Memory Card (backup media)	1 slot (Compact Flash)	
Serial interface	RS-232C/422	
Indicators	Power, operation, error, Memory Card	
Ambient temperature	Operating: 0 to 50°C, Storage: -25 to 60°C (with no icing or condensation)	
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)	
Vibration resistance	10 to 150 Hz; half-amplitude: 0.35 mm (maximum acceleration 50 m/s) 10 times for 8 minutes each in 3 directions (except for bottom surface mounting)	
Shock resistance	150 m/s <sup>2</sup> 3 times each in 6 directions	
Ground	Ground the V530-R2000's ground terminal to less than 100 Ω.	
Weight (Controller only)	Approx. 570 g (Controller only)	
Degree of protection	IEC60529 IP20	
Materials	ABS/PC	
Accessory	Connector for I/O terminals, ferrite core, mounting bracket	



**Camera**  
**F160-S2-2D**



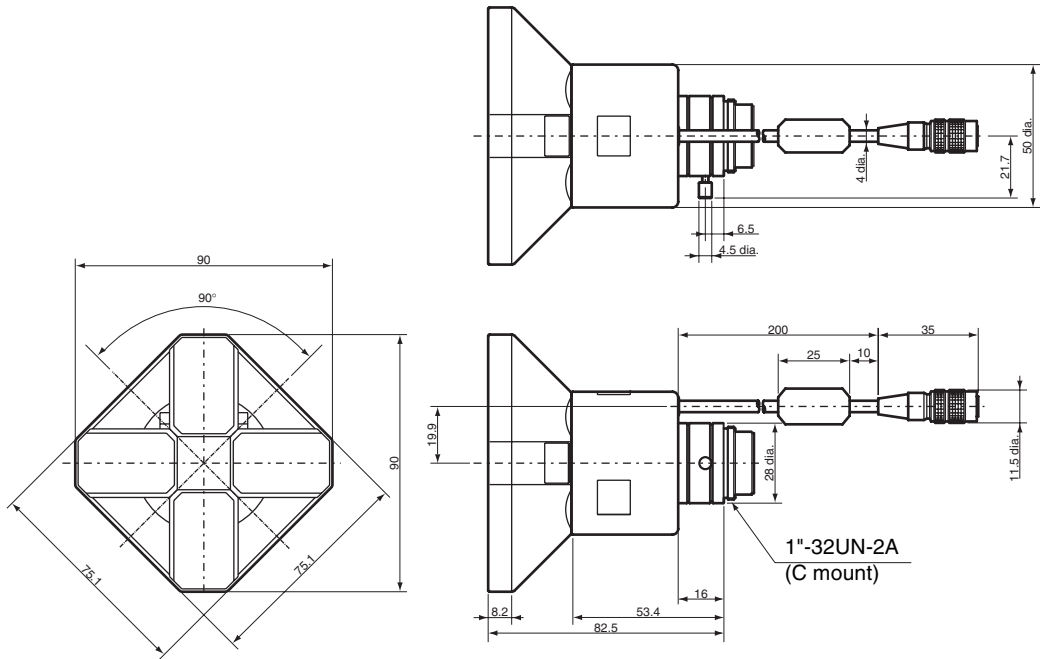
**General Specifications**

Picture elements	1/3" interline CCD (reading all pixels)
Effective pixels	512 × 484 pixels
Synchronization	External sync via horizontal sync signal
Shutter speed (s)	1/120, 1/200, 1/500, 1/1000, 1/2000, 1/4000, 1/8000, 1/16000, 1/30000, or 1/60000; Automatically selected.
Lens mount	C mount
Ambient temperature	Operating: 0 to 50°C, Storage: -25 to 60°C (with no icing or condensation)
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gasses
Vibration resistance	10 to 150 Hz; half-amplitude: 0.35 mm (maximum acceleration 50 m/s <sup>2</sup> ) 10 times for 8 minutes each in 3 directions
Shock resistance	150 m/s <sup>2</sup> 3 times each in 6 directions
Materials	Cover: Zinc-plated steel sheet, thickness: t0.6 (SECC-C) Case: Die-cast aluminum alloy Mounting base: Bakelite containing cloth (black)
Weight	Approx. 85 g



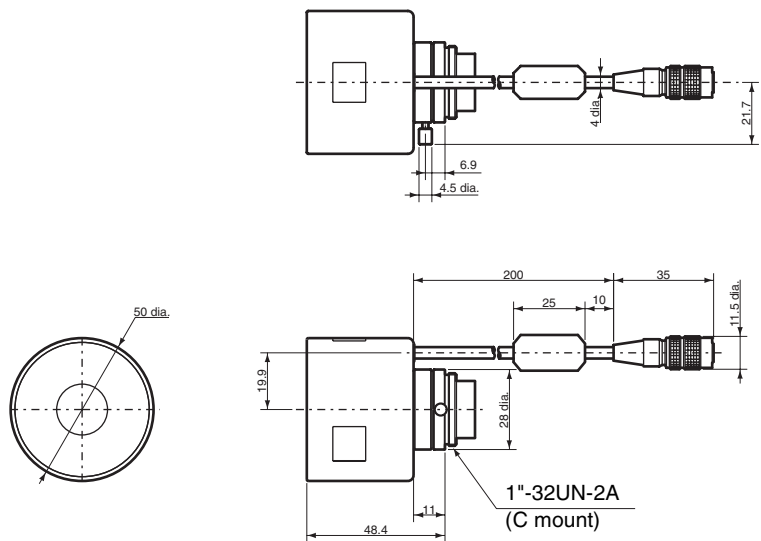
Reading Heads  
V530-L2001

(Unit: mm)



V530-L2002

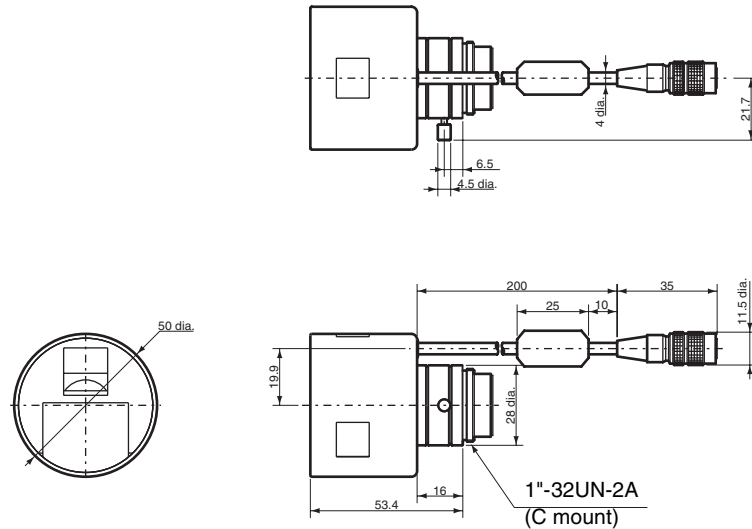
(Unit: mm)





**V530-L2003**

(Unit: mm)



**General Specifications**

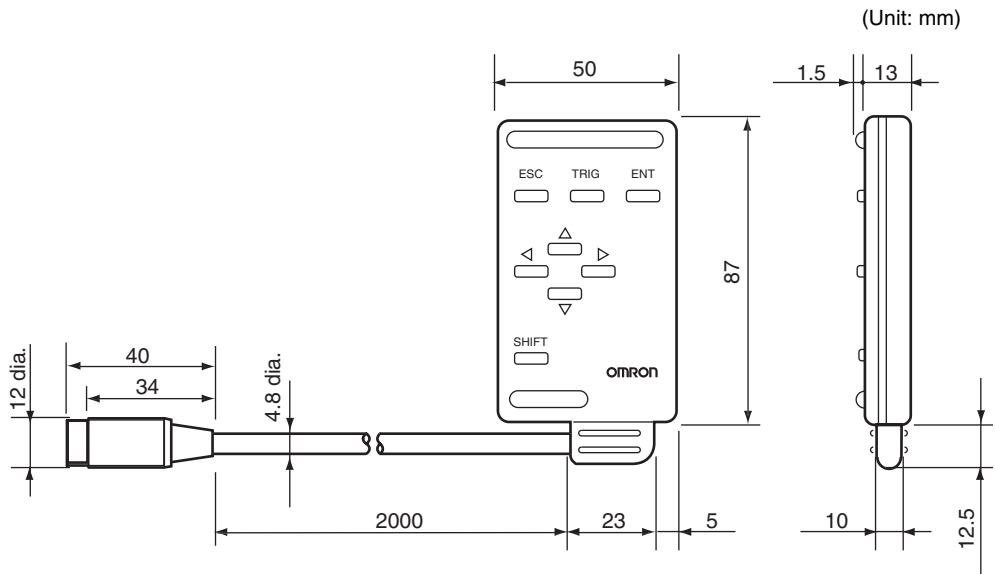
Model	V530-L2001	V530-L2002	V530-L2003
Ambient temperature	Operating: 0 to 50°C, Storage: -25 to 60°C (with no icing or condensation)		
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)		
Ambient environment	No corrosive gasses		
Vibration resistance	10 to 150 Hz; half-amplitude: 0.35 mm (maximum acceleration 50 m/s <sup>2</sup> ) 10 times for 8 minutes each in 3 directions		
Shock resistance	150 m/s <sup>2</sup> 3 times each in 6 directions		
Materials	Case: ABS, Front filter: PMMA, Lens body: Aluminum		
Weight (including cable)	Approx. 160 g	Approx. 100 g	Approx. 110 g
Accessory	Allen wrench		

**Performance Specifications**

Model	V530-L2001	V530-L2002	V530-L2003
Light source	White LEDs	White LEDs	White, red, green, and blue LEDs
Working distance (installation distance)	20 mm	105 mm	35 mm
Field of vision	5 × 5 mm to 12 × 12 mm	20 × 20 mm to 40 × 40 mm	5 × 5 mm to 12 × 12mm
Functions	Automatic lighting direction selection	---	Automatic lighting color selection
	Zoom		
	Rotation (using enclosed Allen wrench)		
Mount	C mount		
System	Fixed aperture, variable focus		
Light emission method	Pulse (Light emission synced with Camera shutter.)		



Console  
F150-KP-2D

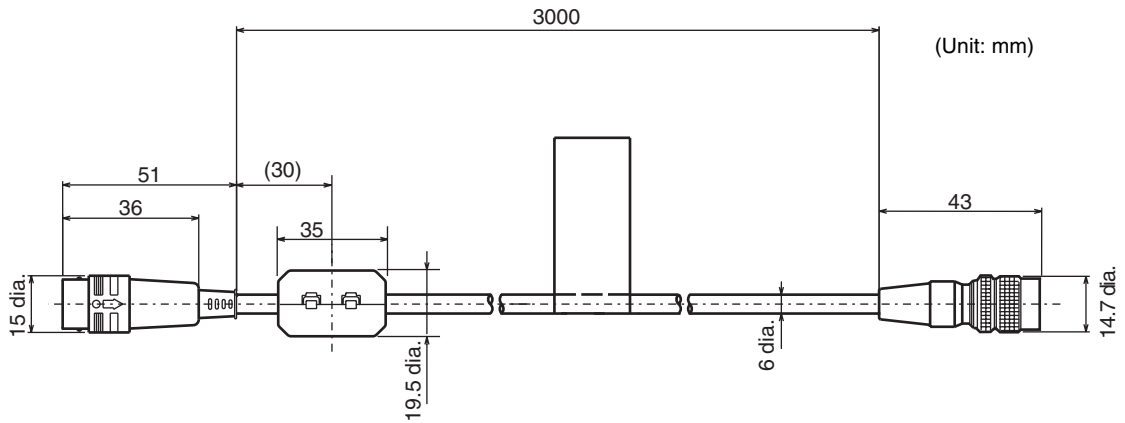


General Specifications

Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s <sup>2</sup> 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C, Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gasses
Degree of protection	IEC60529 IP20 (in-panel)
Minimum bending radius	75 mm
Materials	Body: ABS Cable sheathing: Heat-resistant vinyl chloride Connector: PC, PBT
Weight	Approx. 135 g



**Camera Cable  
F150-VS-2D**

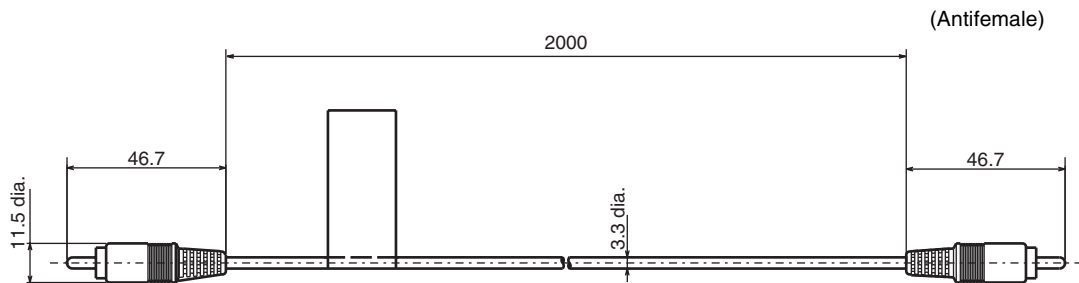


**General Specifications**

Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s <sup>2</sup> 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C, Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gasses
Materials	Cable sheathing: Heat-resistant vinyl chloride Connector: Fiberglass-reinforced PC, PBT
Minimum bending radius	75 mm
Weight	Approx. 170 g



Monitor Cable  
F150-VM-2D

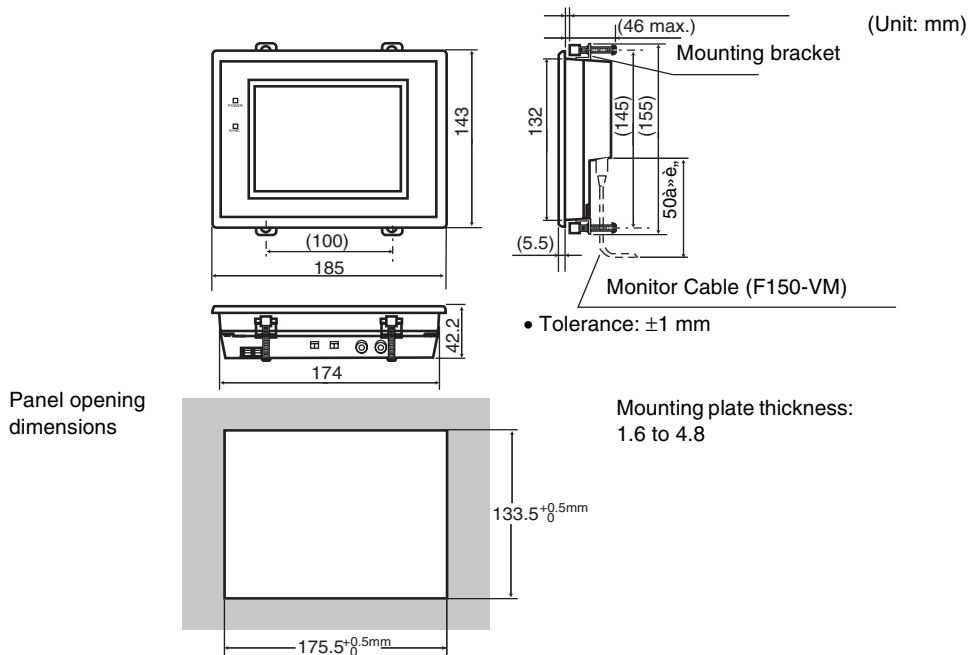


General Specifications

Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm 4 times for 8 minutes each in 3 directions
Shock resistance	196m/s <sup>2</sup> 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C, Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gasses
Materials	Cable sheathing: Ultra flame-resistant vinyl chloride, Connector: PVC
Minimum bending radius	50 mm
Weight	Approx. 40 g
Accessory	BNC jack



LCD Color Monitor  
F150-M05L-2D



General Specifications

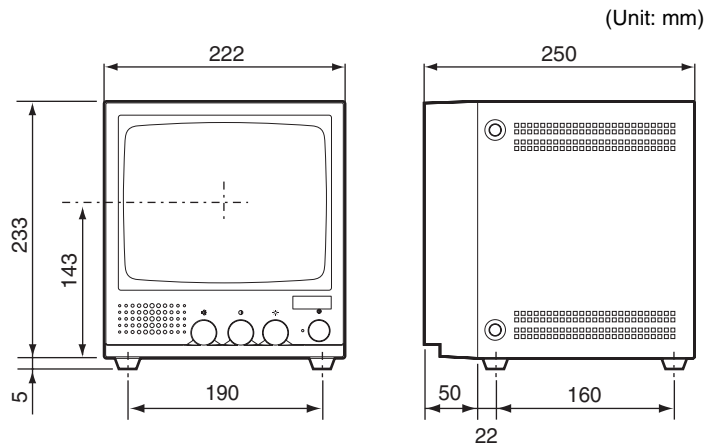
Power supply voltage	20.4 to 26.4 VDC
Current consumption	700 mA max.
Vibration resistance	10 to 150 Hz; half-amplitude: 0.1 mm (maximum acceleration 15 m/s <sup>2</sup> ) 10 times for 8 minutes each in 3 directions
Shock resistance	150 m/s <sup>2</sup> 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C, Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gasses
Degree of protection	IEC60529 IP20
Materials	Case: ABS/PC, Display: PMMA (acrylic)
Weight	Approx. 610 g
Accessory	4 mounting brackets

Performance Specifications

Panel size	5.5 inches 111.36 (H) × 83.52 (V) mm
Panel type	TFT color liquid crystal
Resolution	320 x 240 dots
Image pitch	0.348 (H) × 0.348 (V) mm
Contrast	85:1 (Typical)
Viewable angle	25° up/down and 50° left/right (with a contrast ratio greater than 10)
Luminance	250 cd/m <sup>2</sup> (Typical)
Backlight	Cold cathode fluorescent light
Response speed	60 ms max.
Input signal	NTSC COMPOSITE VIDEO (1.0 V/75 $\Omega$ termination)



Video Monitor  
F150-M09-2D



General Specifications

Power supply voltage	85 to 264 VAC 50/60Hz
Current consumption	20 W max.
Vibration resistance	5 to 100 Hz; half-amplitude: 0.16 mm (maximum acceleration 7.35 m/s <sup>2</sup> ) 6 times for 10 minutes each in 3 directions
Ambient temperature	Operating: -10 to 50°C, Storage: -20 to 65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 10% to 90% (with no condensation)
Ambient environment	No corrosive gasses
Materials	Front: ABS plastic Metal part: SECC (Galvanized steel sheet)
Weight	Approx. 4.5 kg

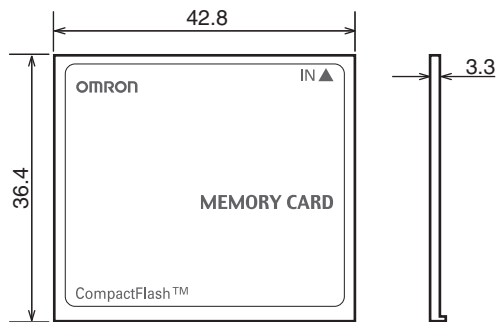
Performance Specifications

CRT size	9 inches 164 (H) × 123 (V) mm
CRT type	Monochrome CRT
Resolution	800 TV lines min. (at center)
System	Number of scanning lines: 600 Horizontal frequency: 15.75 kHz Field frequency: 60 Hz
I/O impedance	75 Ω, high impedance (selectable)
I/O level and polarity	Composite image signal: 1 V (peak to peak) Image: 0.7 V (peak to peak), positive Synchronization: 0.3 V (peak to peak), negative
Input signal	NTSC COMPOSITE VIDEO (1.0 V/75 Ω termination)



Memory Cards  
F160-N64S(S)  
QM300-N128S

(Unit: mm)



General Specifications

Ambient temperature	Operating: 0 to 60°C, Storage: -25 to 85°C (with no icing or condensation)
Ambient humidity	Operating/storage: 8% to 95% (with no condensation)
Ambient environment	No corrosive gasses
Life expectancy	300,000 overwrite operations
Number of pins	50 pins
Weight	Approx. 15 g



# ASCII Table

Data read with Normal commands using the serial interface is output in two characters of ASCII. The ASCII correspond to the following characters.

Example:

- When the read data is A, 41 is output.
- When the read data is T, 54 is output.

		Most significant 4 bits							
		0	1	2	3	4	5	6	7
Least significant 4 bits	0		D <sub>E</sub>		0	@	P	`	p
	1	S <sub>H</sub>	D <sub>1</sub>	!	1	A	Q	a	q
	2	S <sub>X</sub>	D <sub>2</sub>	”	2	B	R	b	r
	3	E <sub>X</sub>	D <sub>3</sub>	#	3	C	S	c	s
	4	E <sub>T</sub>	D <sub>4</sub>	\$	4	D	T	d	t
	5	E <sub>Q</sub>	N <sub>K</sub>	%	5	E	U	e	u
	6	A <sub>K</sub>	S <sub>N</sub>	&	6	F	V	f	v
	7	B <sub>L</sub>	E <sub>B</sub>	'	7	G	W	g	w
	8	B <sub>S</sub>	C <sub>N</sub>	(	8	H	X	h	x
	9	H <sub>T</sub>	E <sub>M</sub>	)	9	I	Y	i	y
	A	L <sub>F</sub>	S <sub>B</sub>	*	:	J	Z	j	z
	B	H <sub>M</sub>	E <sub>C</sub>	+	;	K	[	k	{
	C	C <sub>L</sub>	↑	,	<	L	\	l	!
	D	C <sub>R</sub>	↓	-	=	M	]	m	}
	E	S <sub>O</sub>	→	.	>	N	^	n	~
	F	S <sub>I</sub>	←	/	?	O	_	o	



# FCS Check Programming Examples (BASIC)

## ■ Calculation Example for Sending FCS

DATA\$	Sample data line
L	Data length
CODE\$	Data character
A	Exclusive OR

```

100      *****CALCULATE FCS*****
110      *FCSSET
120      L=LEN(DATA$)
130      A=0
140      FOR J=1 TO L
150      CODE$=MID$(DATA$,J,1)
160      A=ASC(CODE$)XOR A
170      NEXT J
180      FCS$=HEX$(A)
190      IF LEN(FCS$)=1 THEN FCS$="0"+FCS$
200      RETURN

```

## ■ FCS Check Subroutine Example for Received Data

```

1000     *****FCSHECK*****
1010     *FCSHECK
1020     Q=0:FCSP$="OK"
1030     PRINT RESPONSE $
1040     LENG$=LEN(RESPONSE$)-3
1050     FCSP$=MID$(RESPONSE$,LENG$+1,2)      'FCS in response data
1060     FOR J=1 TO LENG$                      'Calculation range of FCS'
1070     Q=ASC(MID$(RESPONSE$,J,1))XOR Q
1080     NEXT J
1090     FCSD$=HEX$(Q)
1100     IF LEN(FCSD$)=1 THEN FCSD$="0"+FCSD$   'FCS calculated in a program
1110     IF FCSD$ < > FCSP$ THEN FCSP$="ERR"
1120     PRINT "FCSD$=";FCSD$;"FCSP$=";FCSP$;    'FCS correctly received: OK
                                           "FCSP$=";"FCSP$=" 'FCS not received correctly: ERR
1130     RETURN

```



## ■ FCS Calculation

FCS (Frame Check Sequence) is the result of taking the XOR for each byte between the prefix and suffix (8 bits) and converting to 2-character ASCII.

The FCS can be attached to output data to improve communications.

Each time data is received, the Host Link system calculates the FCS and checks it against the FCS attached to the sent data so that the sent data can be checked for errors.



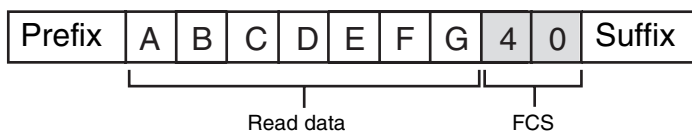
An FCS can be appended only if the communications mode is set to **Normal**.  
p.40

## ■ Example FCS Calculation

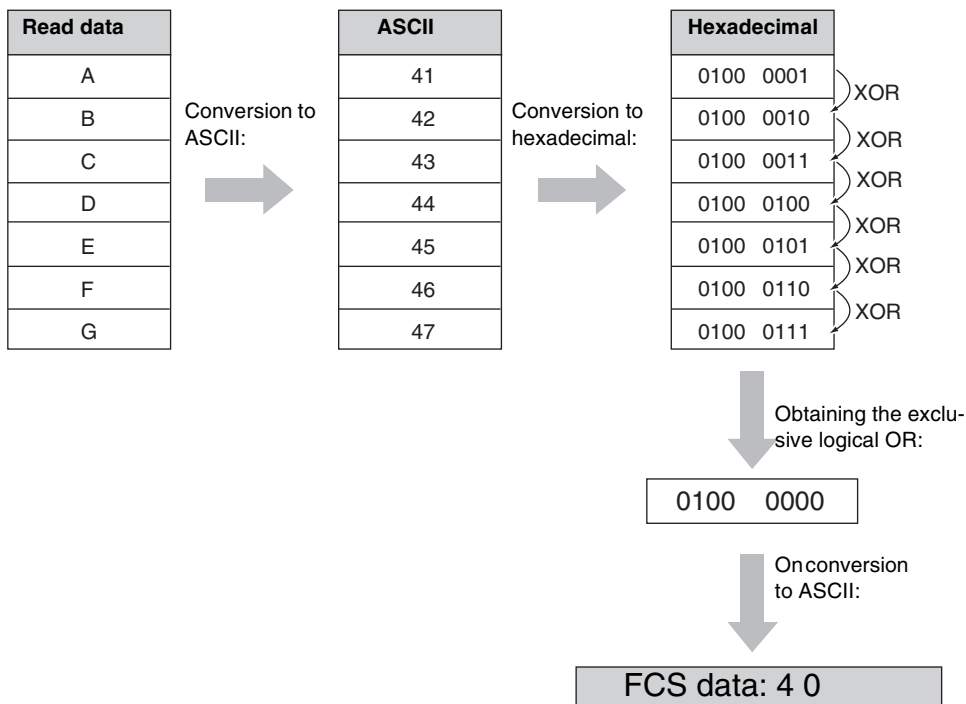
Example read data: ABCDEFG

The details of the read data and calculation method are as follows:

Read data



### • Calculation





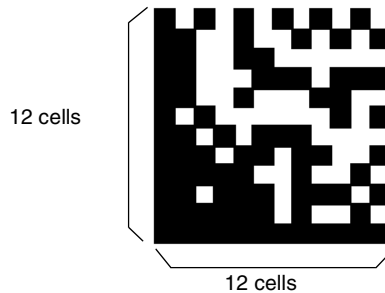
# Data Capacity Tables

The maximum quantity of information that can be stored depends on the symbol size of the code. The maximum data capacity in relation to the amount of information carried by the code depends on the character type and the arrangement and combination of characters. The relation between the symbol size (number of cells) and data capacity is shown in the following table.

## ■ DataMatrix

### ■ DataMatrix ECC200

In the following diagram, the symbol size is  $12 \times 12$ .



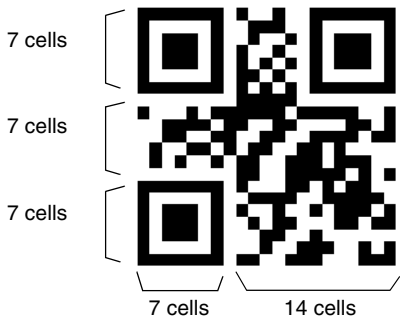
Symbol size	Data capacity		
	Numerals	Alphanumeric characters	Alphanumerics and symbols
$10 \times 10$	6	3	3
$12 \times 12$	10	6	5
$14 \times 14$	16	10	9
$16 \times 16$	24	16	14
$18 \times 18$	36	25	22
$20 \times 20$	44	31	28
$22 \times 22$	60	43	38
$24 \times 24$	72	52	46
$26 \times 26$	88	64	57
$32 \times 32$	124	91	81
$36 \times 36$	172	127	113
$40 \times 40$	228	169	150
$44 \times 44$	288	214	190
$48 \times 48$	348	259	230
$52 \times 52$	408	304	270
$64 \times 64$	560	418	372
$8 \times 18$	10	6	5
$8 \times 32$	20	13	12
$12 \times 26$	32	22	20
$12 \times 36$	44	31	28
$16 \times 36$	64	46	41
$16 \times 48$	98	72	64



■ QR Code

■ QR Code (Model 2)

In the diagram below, the symbol size is  $21 \times 21$ .



Symbol size (version)	Error correction level	Data capacity	
		Numerals	Alphanumeric characters (uppercase)
21 × 21 (Version 1)	L (7%)	41	25
	M (15%)	34	20
	Q (25%)	27	16
	H (30%)	17	10
25 × 25 (Version 2)	L (7%)	77	47
	M (15%)	63	38
	Q (25%)	48	29
	H (30%)	34	20
29 × 29 (Version 3)	L (7%)	127	77
	M (15%)	101	61
	Q (25%)	77	47
	H (30%)	58	35
33 × 33 (Version 4)	L (7%)	187	114
	M (15%)	149	90
	Q (25%)	111	67
	H (30%)	82	50
37 × 37 (Version 5)	L (7%)	255	154
	M (15%)	202	122
	Q (25%)	144	87
	H (30%)	106	64
41 × 41 (Version 6)	L (7%)	322	195
	M (15%)	255	154
	Q (25%)	178	108
	H (30%)	139	84
45 × 45 Version 7)	L (7%)	370	224
	M (15%)	293	178
	Q (25%)	207	125
	H (30%)	154	93



Symbol size (version)	Error correction level	Data capacity	
		Numerals	Alphanumeric characters (uppercase)
49 × 49 (Version 8)	L (7%)	461	279
	M (15%)	365	221
	Q (25%)	259	157
	H (30%)	202	122
53 × 53 (Version 9)	L (7%)	552	335
	M (15%)	432	262
	Q (25%)	312	189
	H (30%)	235	143
57 × 57 (Version 10)	L (7%)	652	395
	M (15%)	513	311
	Q (25%)	364	221
	H (30%)	288	174

Source: 2D Codes, Basic Specifications for QR Code (JIS X 0510)

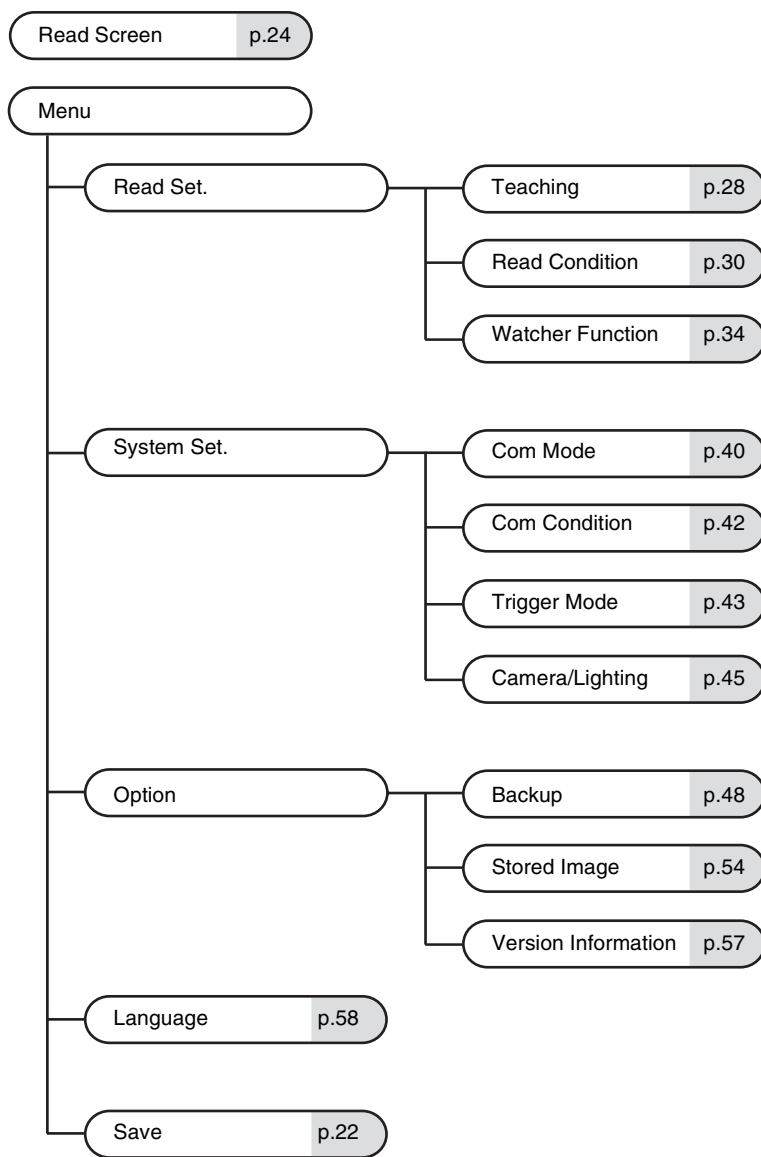


#### Maximum Data Capacity

Even with the same 2D code, the maximum quantity of information that can be stored depends on the symbol size of the code. In other words, the symbol size must be increased to increase the data capacity. The data capacity also depends on the type of characters used for the information contained in the code. The QR Code and DataMatrix code, the maximum number of characters for the same symbol size will be greatest with numbers only and then with alphanumerics, and will be the least with 2-byte characters. The data capacity also depends on the order and combination of characters used.



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# Revision History

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A manual revision code appears as a suffix to the catalog number on the front cover of the manual.

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Revision code

The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
01	September 2003	Original production
01A	September 2003	<b>Page 67:</b> Output portion changed for @GL command. <b>Page 68:</b> Output portion changed for @RD command.
01B	December 2004	<b>Pages ii to iv:</b> Replaced with new version of this material. <b>Pages 67 and 68:</b> Replaced output information.
01C	January 2006	<b>Page 106:</b> Discription changed







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